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1. Papers that contain original thinking in education or educational research.
2. Papers that make a significant contribution towards developing a theory.
3. Papers that summarize and discuss an outstanding study or piece of educational research.
4. Papers that review significant research in important areas.
5. Letters to the Editor on important research problems.

The emphasis is on categories 2, 3, 4 and 5. Ordinarily a paper is not accepted if it has appeared in print in any form elsewhere. Exceptions may be made for contributions which the editors consider should be made known to a wider public. In such cases, a copy of the publication in which the paper has appeared earlier should be sent with it.

Manuscripts sent for consideration should be typed double-spaced on one side of the paper only. References in the text to the work of other researchers should be made by giving the name of the researcher, and the year in which his research was published, in round brackets and *not* in the form of serial numbers which connect with the list of references at the end. Typescript in duplicate should be sent to the Editor, and at least one copy retained by the writer for reference.

Tables, charts and graphs should be finalized carefully before sending. They should be clearly and accurately captioned and inked to size, and their places designated in the manuscript.

(Contd. on Cover iii)

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Measuring Intelligence through Bicycle Drawings

T. R. Sharma

Indian investigators have evinced keen interest in Goodenough's method of measuring children's intelligence through drawing. The author, however, feels that in drawing a man the element of sex adversely affects the equality of familiarity with the subject by boys and girls, which is a necessary characteristic of test construction. Moreover, the element of dress in all its varieties disturbs to a great extent the objectivity of scoring. As for drawing a house, children from different areas have different concepts of a house. As regards the cow (another subject for a drawing test), all children are not equally familiar with it. The author has, therefore, preferred to make use of the bicycle and has devised, standardized, and calculated the reliability and the validity of a 'draw-a-bicycle' test, of which he gives an account in this paper.

Corrado Ricci's account (1887) explaining the variations found in the spontaneous drawings made by a group of young Italian children is perhaps the earliest scientific work, of which we have a written record, connecting mental ability with juvenile doodles. Perez (1888), Barnes (1893), Baldwin (1894), Maitland (1895), Luckens (1896), Brown (1897) and Gotza (1898) are some of the notable names who contributed to the growth of mental study through drawings in the

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last decade of the nineteenth century. Their writings were mostly descriptive although here and there one does come across some mathematical treatment also.

The real scientific work, however, began in the beginning of the 20th century. Schutyten (1901, 1904 and 1907) tried to establish a standard of excellence for each age in a series of age norms. He used the human figure as the subject and drawings were made from memory. Lamprecht (1906) invited drawings made by children from all parts of the world and from all levels of civilization, from primitive to advanced, according to standard directions. He collected many thousands of drawings, samples coming from almost every nation in the world. It is unfortunate, however, that this investigation which had great possibilities for psychology and education was not completed. Levnistein (1905), a collaborator of Lamprecht, published a summary of selected portions from this vast collection but no adequate comparative study of the entire collection ever appeared. Claparedo (1907) outlined a plan similar to Lamprecht and proposed to enlist developmental stages in drawings with the idea of ascertaining what relationship, if any, existed between aptitude in drawing and general intellectual. ability. Working on Claparedo's plan, Ivanoff (1909) worked out a method of scoring drawings according to a 6-point scale which included sense of proportion, imaginative conception, technical and artistic value. He compared the obtained values with teachers' rating of general ability and certain moral and social traits and found a positive correlation in nearly all instances. Kerschensleiner (1905) collected about 100,000 drawings made under standardized conditions by children in Munich and surrounding areas and pointed out that there were both qualitative and quantitative differences between the drawings of feeble-minded and normal children and that boys exceeded the girls in all types of drawings except certain kinds of decorative design, in which girls did better than the boys. Rouma (1913) clearly brought out that the drawings of sub-normal children resembled those of young children. Manual (1919) ventured to measure general ability and a certain specific type of ability through children's drawings.

Burt's analysis (1921) based on his personal observation and those of earlier investigations is a lucid and perceptive account of the field under review. For him "drawing is a mode of self-revelation, particularly useful when speech and writing are inadequate, it (drawing) gives penetrating glimpse into the child's powers of imagination and construction—of imagination, in terms of real things visualised rather than of mere words uttered; of construction, in the sense of self-expression through the hand as guided by the eye." He described distinct developmental character of juvenile drawings and presented an excellent perceptive account of their developmental stages. Florence Goodenough (1929) very successfully demonstrated that a large, intellectual component existed in the development of children's drawings. She developed a test in which the subject is simply instructed to 'make a picture of man, make the very best picture that you can'. In scoring the test the emphasis was placed upon the child's accuracy of observation and upon the development of conceptual thinking, rather than upon drawing ability. A scoring system of 51-points was developed in which credit was given for the inclusion of individual body parts; clothing, details, proportion, perspective and smilar features. The scoring items were selected through five successive revisions, on the basis of age and grade differentiation. She demonstrated that drawings for children had a more cognitive than aesthetic meaning. A French investigator Fay (1924, 34) developed a method of drawing analysis somewhat similar to Goodenough's at about this time but it was never published widely. The Fay test consists of asking a child to illustrate the situation 'A lady takes a walk and it rains'. The subject has five minutes to complete the drawing. Scoring is in terms of details included by the child.

Wintsch (1935) reported an extensive study of children's drawings of the human figure and gave norms for French-Swiss children. He also used the Fay test with various European children as did Andre Rey (1946). Rey does not find the measure useful after twelve. Oakley (1940) proposed to extend Goodenough's method of drawings to adolescents and suggested a number of promising leads. Berdie (1945) reported a correlation of +.62 between Goodenough and Wechsler I.Q.'s with older children of average and below average ability and Birch (1949) found that draw-a-man test discriminated adequately among adolescents of Binet I.Q. 70 or lower.

Indian investigators evinced a keen interest in Goodenough's method of measuring children's intelligence through drawings. The names of Manzel (1935), Dutta (1935), Minakshi (1940), Mitra (1952), Arul (1953), Phatak (1956), Shah (1959), Rana (1965), Phatak (1966), deserve a special mention.

Harris (1963) improved upon the scale standardized by Goodenough (1926) and produced a revised scale known as Harris-Goodenough scale. He retained the human figure and set up a test of three drawings—a man figure, a woman figure and the drawing of the self. Work done by Harris apart from suggesting further lead in the field of intelligence has suggested quite a new medium of understanding the psychology of the child through his drawing of the self.

Goodenough employed human figure as the subject of drawing although houses, trees, furniture, boats, ships, etc., had also been used by early investigators like Rouma (1913), McCarthy (1934), and others. In recent years animals, especially cows and horses, have also been used. Du Bois (1939) prepared a sixty-point Goodenough type scale for the drawing of a horse and concluded that the horse-drawing test was a more valid measure of mental ability than the Goodenough draw-a-man test. Markhan (1954) employed the drawing of the house and Kunjlata Desai (1958) used the drawing of the cow for this very purpose.

The Bicycle Test

In the case of 'man', the element of sex adversely affects the equality of acquaintance of the subject to both boys and girls, which is a requisite characteristic of test construction. Moreover, the element of dress in all its varieties disturbs the objectivity of scoring to a great extent. The 'house' has altogether different concepts for children of different areas, and all children are not equally familiar with a house or cow. The investigator, therefore, preferred to make use of an entirely new subject, the 'bicycle' which apart from meeting the above objections has the following additional advantages:

1. Its drawing is seldom practised in schools or the homes.
2. It is a household article and all children are almost equally acquainted with it especially because of the element of mobility in it,
3. It lacks variety.

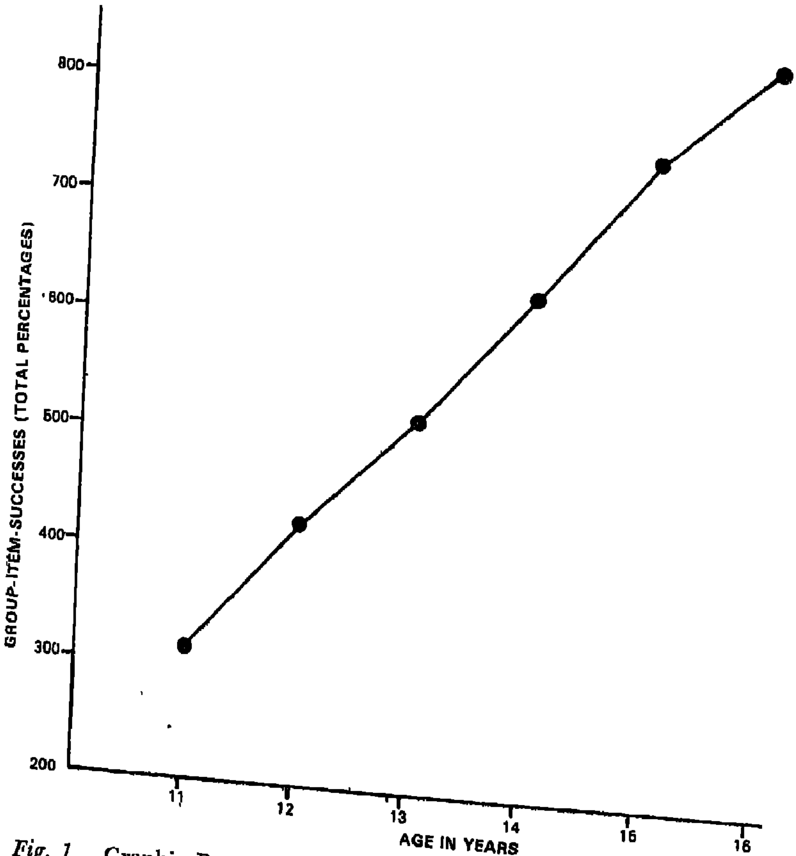

Fig. 1. Graphic Representation of Item-successes with Increasing Age. *Group I—Wheels.*

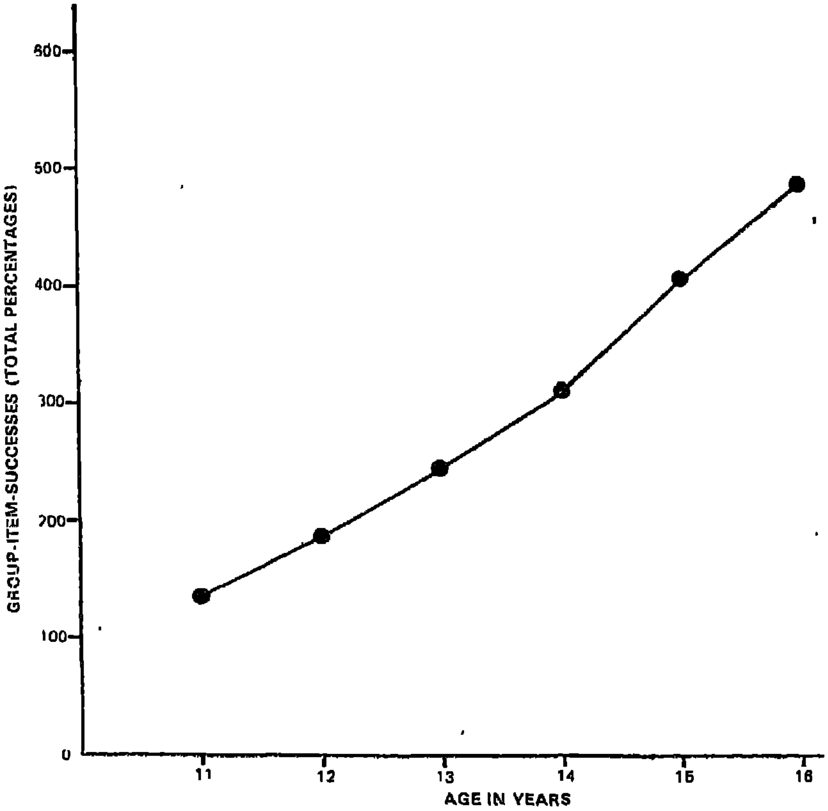

Fig. 2. Graphic Representation of Item-successes with Increasing Age. *Group II—Central Axle.*

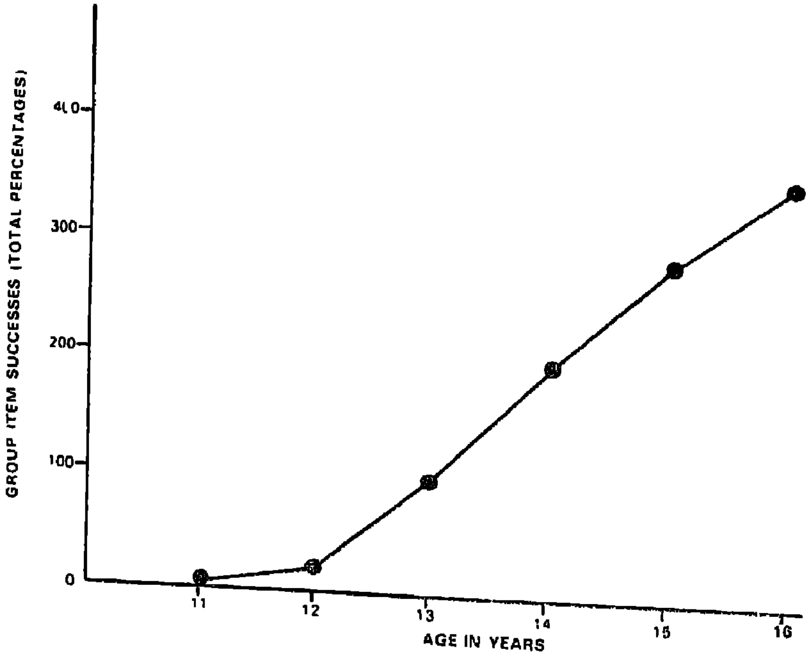

Fig. 3. Graphic Representation of Item-successes with Increasing Age. *Group III—Pedals.*

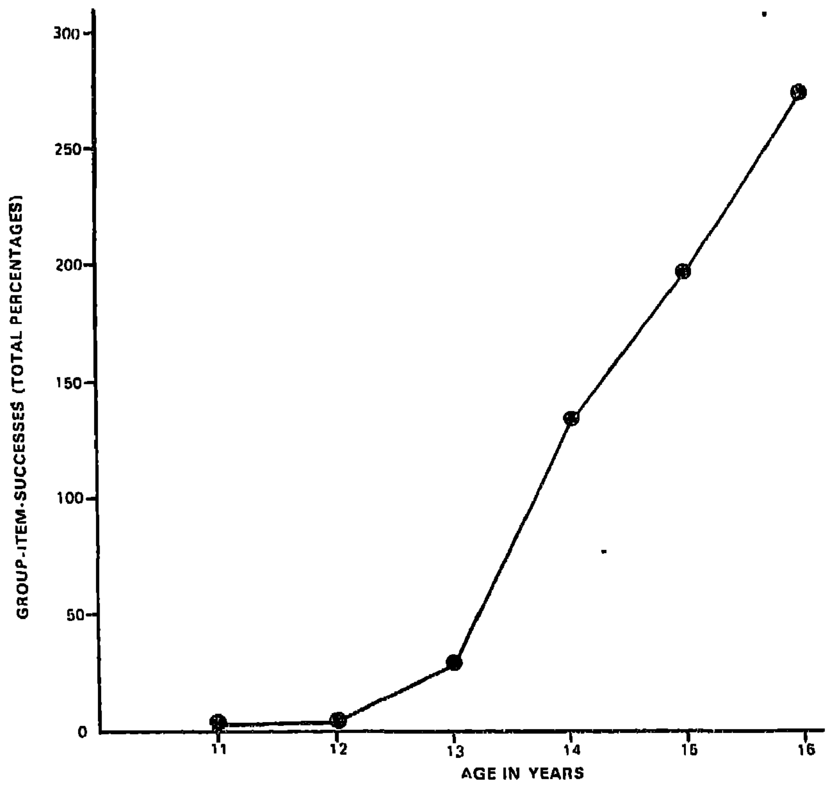

Fig. 4. Graphic Representation of Item-successes with Increasing Age. *Group IV—Free Wheel.*

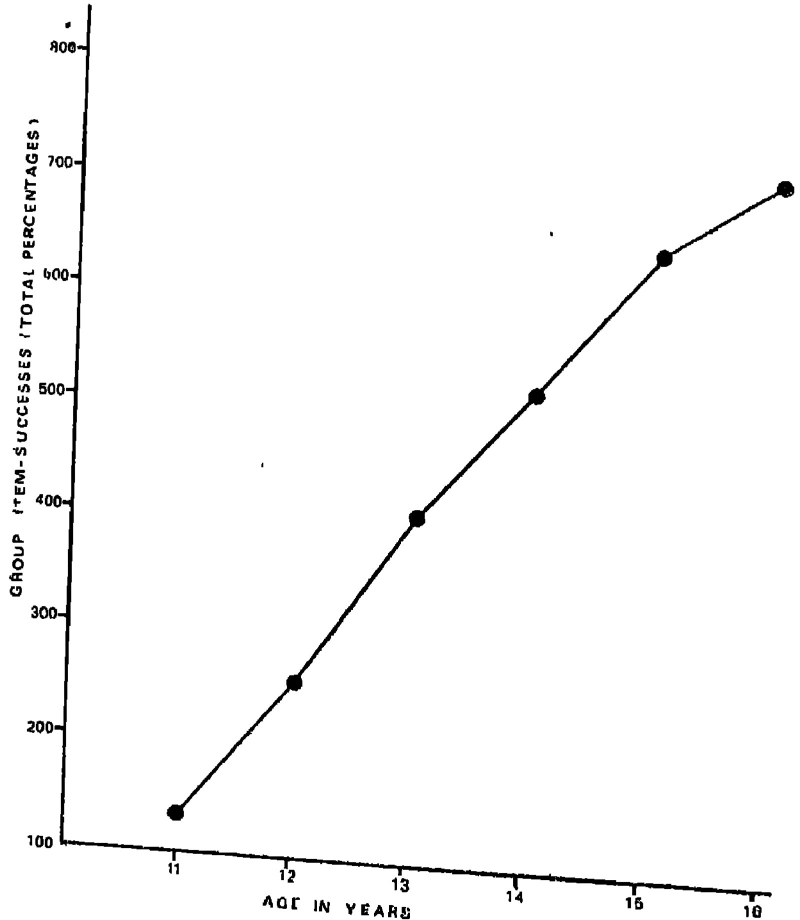

Fig. 5. Graphic Representation of Item-successes with Increasing Age. *Group V—Frame.*

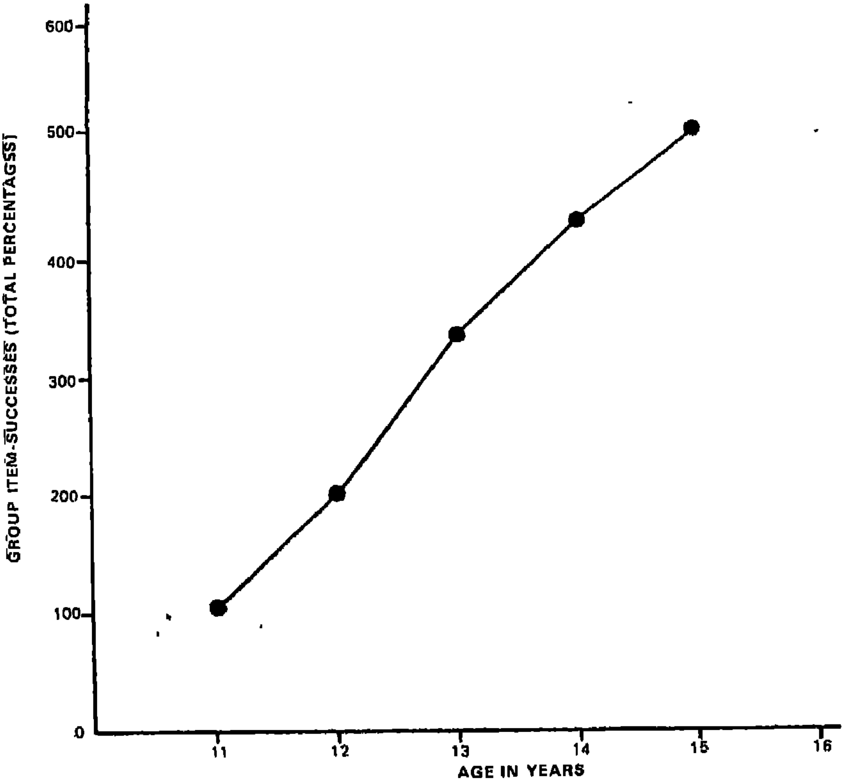

Fig. 6. Graphic Representation of Item-successes with Increasing Age. *Group VI–Handle.*

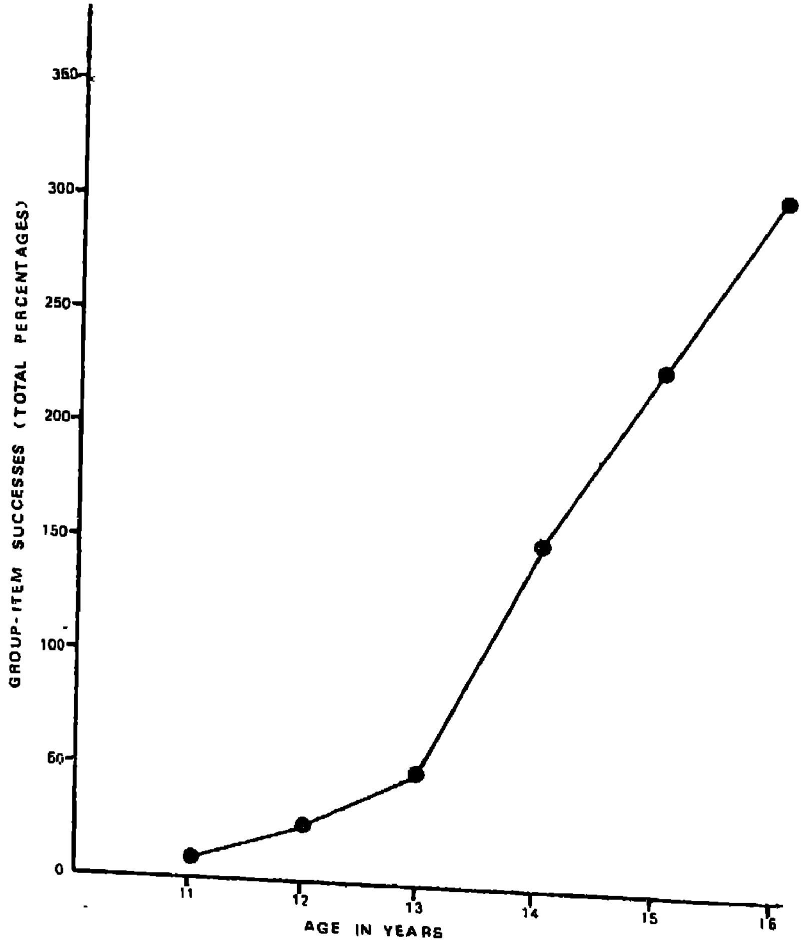

Fig. 7. Graphic Representation of Item-successes with Increasing Age. *Group VII—Brakes.*

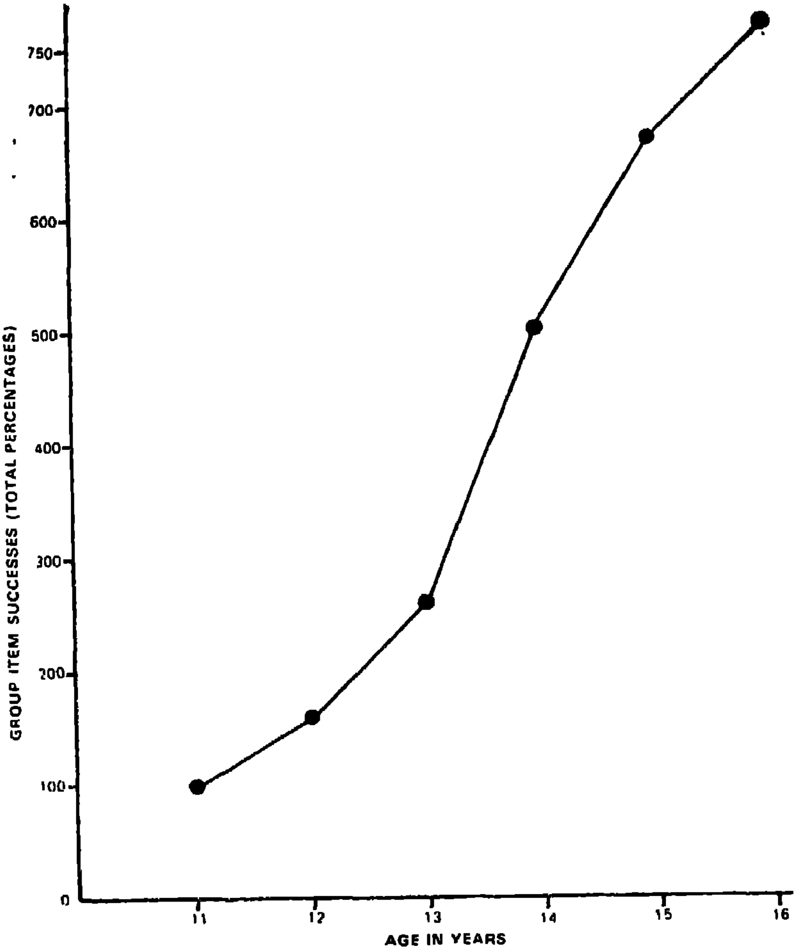

Fig. 8. Graphic Representation of Item-successes with Increasing Age. *Group VIII—Saddle, Carrier and Stand.*

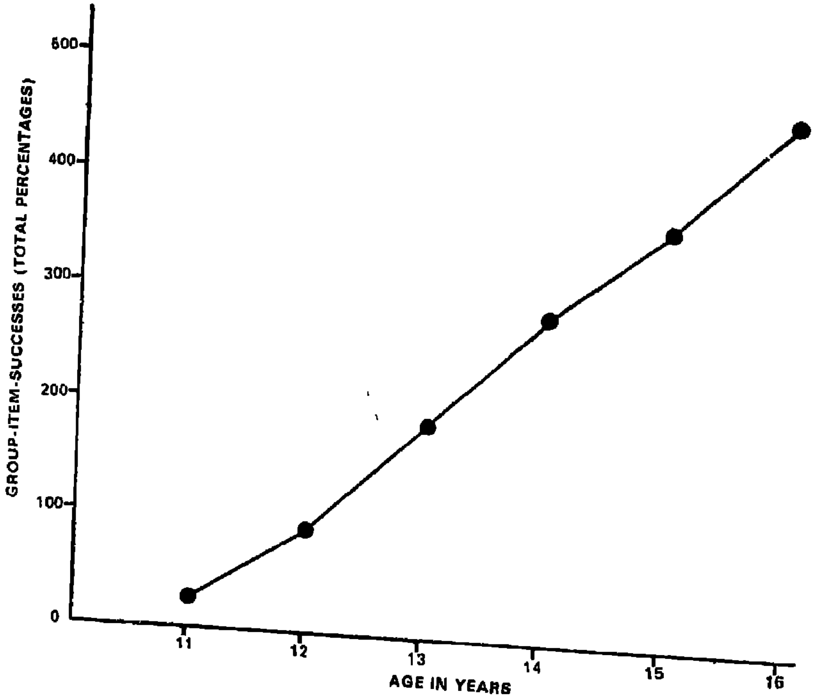

Fig. 9. Graphic Representation of Item-successes with Increasing Age. *Group IX—Accessories.*

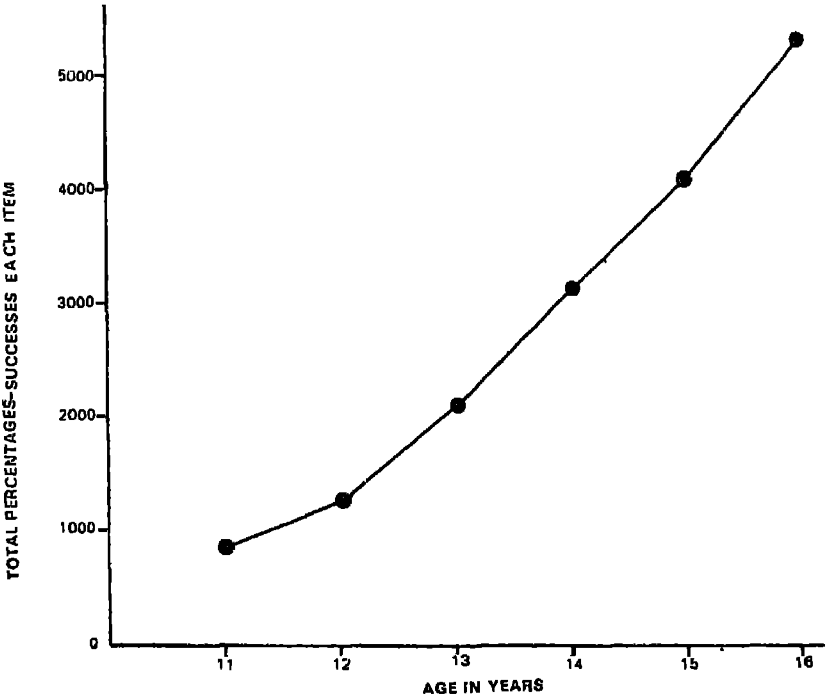

Fig. 10. Graphic Representation of Item-successes with Increasing Age. *Bicycle as a Whole.*

below in a tabular manner:

TABLE 1

Age in Years	*N*	*Range of Raw Scores*	*Mean Score*	*S.D.*	*CR's between Adjacent Groups*
11	367	3-45	24.48 (24.72, 24.19)	7.42	
12	468	3-51	27.15 (27.12, 27.10)	7.75	4.7 (11 and 12)
13	535	3-57	30.09 (30.54, 29.58)	9.90	4.9 (12 and 13)
14	553	9-66	32.70 (32.97, 32.37)	9.92	4.4 (13 and 14)
15	575	9-69	36.18 (36.84, 35.49)	11.11	5.5 (14 and 15)
16	365	14-69	39.36 (40.14, 38.61)	9·72	4.6 (15 and 16)

Brackets contain mean scores of boys and girls respectively.

Since the range of raw scores is nearly equal or greater than 6 S.D.'s, there is a progressive and significant rise of total mean scores with increasing age we may infer that the test is adequately useful for measuring what it does.

Raw scores of boys and girls show a slight increase in favour of boys but difference is not significant statistically.

Norms

The age norms based on smoothed mean scores for different age-groups work out to be as under:

TABLE 2

Age (years)	*Norm*
10 +	21
11 +	24
12 +	27
13 +	30
14 +	33
15 +	36
16 +	39

Evidence for Reliability

1. One hundred and fifty drawings, 25 for each group, out of a sample of 613 drawings collected for second revision of the scoring scale were scored thrice with a break of six days in between each scoring. The coefficients of correlation between the first and the second, and between the second and the third scoring worked out to be .94 and .95. This established scoring consistency.
2. Three scorers who had been given a short intensive training in scoring the test sheets practised scoring on 25 drawings each. When their scoring consistency had been established (self-correlation ranging from .92 to .96) they independently scored 140 drawings turn by turn. The coefficients of inter-correlations between their scoring ranged from 0.901 to .952 which suggests beyond doubt that the scoring scale is fairly reliable.
3. The Test-retest reliability (N=536, span=13 days) works out to be .82 ± .02.
4. The split-half technique brings out reliability coefficients ranging between .84 to .92 for different age groups. Corrected r's after applying Spearman Brown formula range between .91 and .95 for different age groups.
5. When Kuder Richardson formula (No. 21) was applied to raw mean scores the reliability coefficients worked out to be .93.

Evidence for Validity

The test was validated against teachers' estimates of children's intelligence, children's scholastic achievements and the following non-verbal intelligence tests:

1. Goodenough's draw-a-man test standardized by Phatak for Indian conditions.
2. Jenkins' Non-Verbal intelligence test standardized by Central Institute of Education, New Delhi (1961) for Indian conditions.

The range of validity coefficients for different age groups against the above criteria is given in Table 3.

TABLE 3

Criterion	*N*	*Range of r between the Bicycle Test and the Criterion*
Teachers' estimate of children's intelligence	182	.31 to .52
Children's scholastic achievements	193	.43 to .47
Goodenough's test	279	.83 to .89
Jenkin's test	279	.71 to .74

Judged by conventional standards the test is reliable and valid and can be safely put to any use an intelligence test is intended. Some other inferences that follow from the study may be summarised as follows:

1. Bicycle is a favourite drawing subject for children who strive to represent it as it appears to them.
2. The drawing of 'Bicycle' is to a great extent culture free although the investigator agrees with the pronouncement of Goodenough and Harris (1950) that the search for a culture free test, whether of intelligence, artistic ability, personal-social characteristic, or any other measurable trait is illusory.
3. Although the children up to the age of 16 only have been included in the test, yet it is possible to extend the scale upward in age as an index of the same ability measured in children between ages of 11 and 16
4. Boys do slightly better on this test than girls although girls have been all along showing their superiority in drawings. It implies that the drawing ability was not a constituent of measurement.
5. On a specific sample, it was found that training in drawing did not significantly improve the children's scores on this test.

Some Scoring Examples

Fig. 11. Girl, 11-0. Raw Score 10, Standard Score 69, T-Score 31.

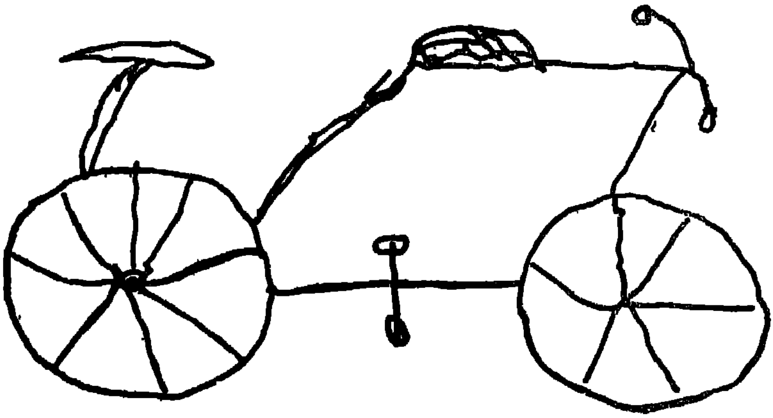

Fig. 11. Girl, 11-0.

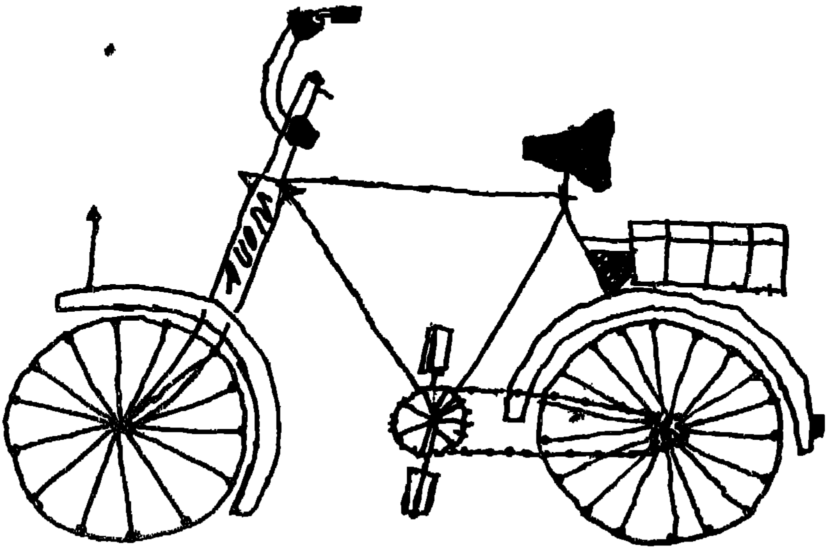

Fig 12. Boy, 11-3.

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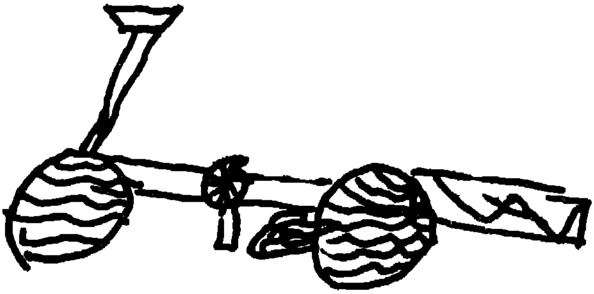


Fig. 13. Girl, 12-8.

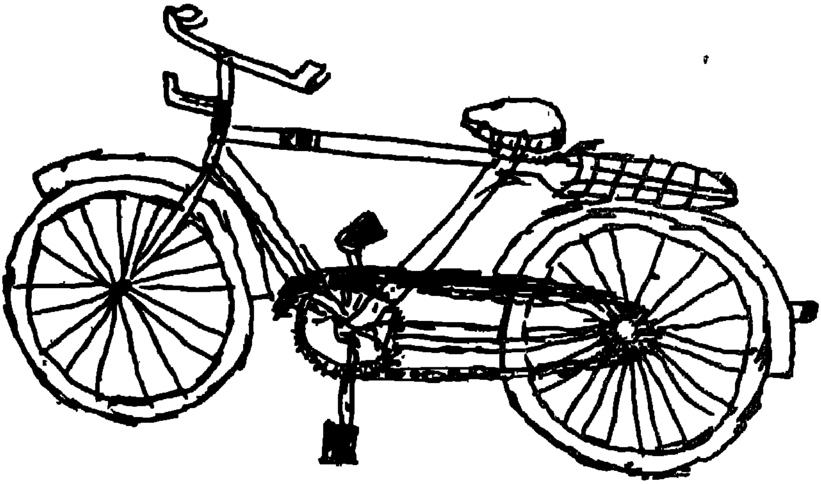


Fig. 14. Boy, 12-4.

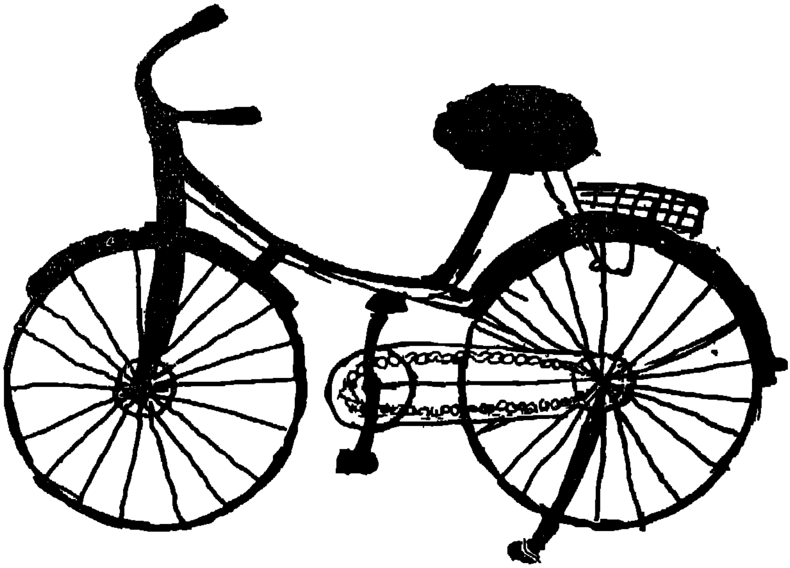
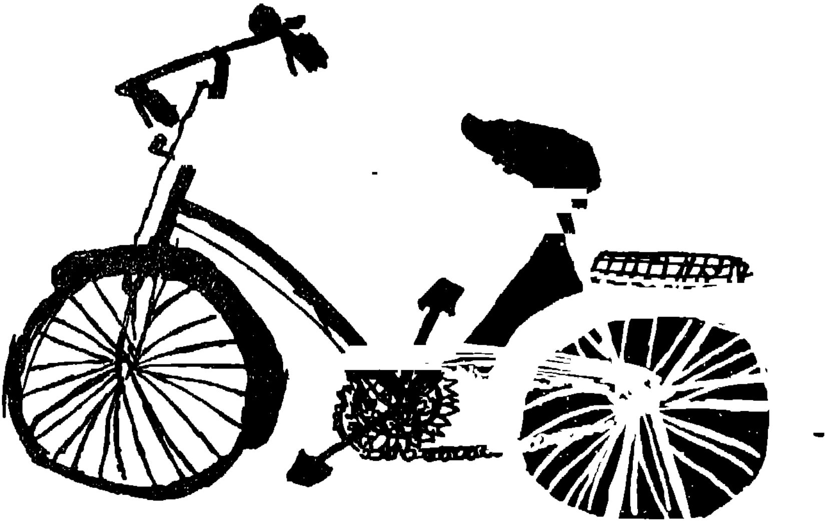


Fig. 15. Girl, 13-2.



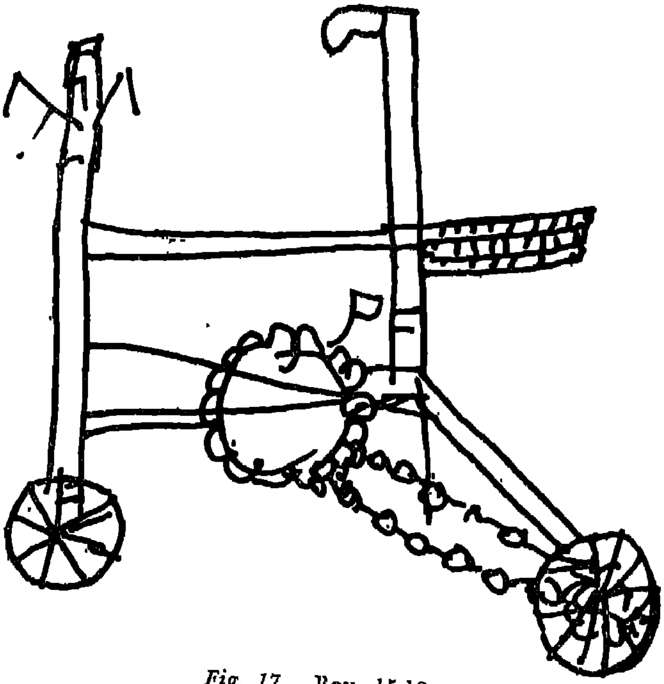


Fig. 17. Boy, 15-10.

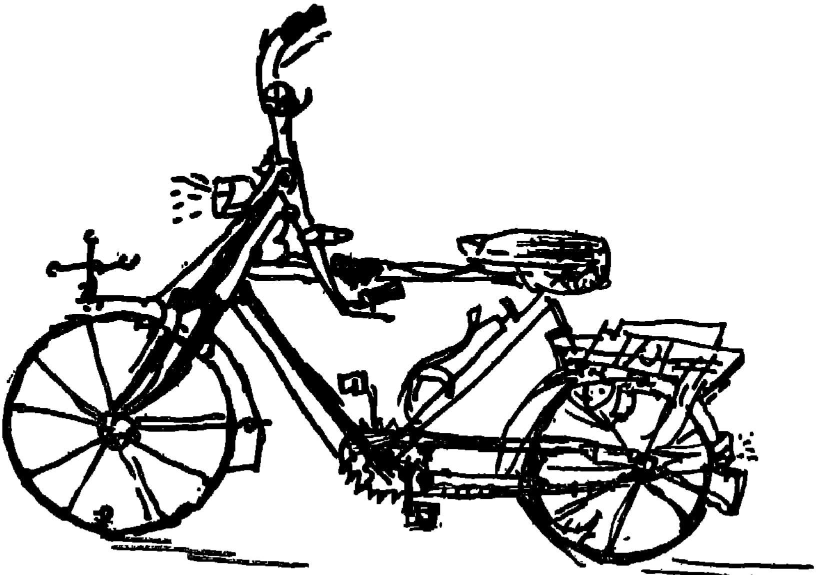


Fig. 18. Boy, 16-7.

Items credited: 1, 2, 20, 21, 30, 34, 39, 43, 52, 56.

Fig. 12. Boy, 11-3. Raw Score 35, Standard Score 119, T-Score 66.

Items credited: 1, 2, 4, 6, 7, 9, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25, 27, 28, 30, 31, 33, 39, 40, 41, 43, 52, 55, 56, 58, 59, 63, 67, 72.

Fig. 13. Girl, 12-8. Raw Score 6, Standard Score 62, T-Score 24.

Items credited: 1, 3, 14, 39, 56.

The Child failed to explain her drawing, when approached.

Fig. 14. Boy, 12-4. Raw Score 335, Standard Score 114, T-Score 60.

Items credited: 1, 2, 6, 7, 11, 13, 15, 16, 17, 18, 19, 20, 21, 22, 25, 26, 27, 28, 30, 31, 33, 36, 38, 39, 40, 41, 44, 45, 53, 56, 58, 63, 68.

Fig. 15. Girl, 13-2. Raw Score 31, Standard Score 99, T-Score 52.
Items credited: 1, 2, 6, 7, 9, 11, 13, 16, 18, 19, 20, 21, 22, 23, 25, 26, 28, 30, 33, 38, 39, 40, 41, 52, 56, 58, 60, 61, 63, 66, 68.

Fig. 16. Girl, 14-5. Raw Score 49, Standard Score 123, T-Score 66.

Items credited: 1, 2, 6, 7, 9, 10, 13, 14, 15, 16, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 52, 53, 56, 57, 58, 60, 61, 63, 67, 68, 75.

Fig. 17. Boy, 15-10. Raw Score 15, Standard Score 69, T-Score 31.

Items credited: 1, 2, 13, 15, 18, 19, 20, 25, 30, 33, 38, 39, 52, 56, 58.

Fig. 18. Boy 16-7. Raw Score 64, Standard Score 138, T-Score 95.
Items credited: 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 30, 31, 32, 33, 34, 36, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 65, 66, 67, 68, 69, 71, 72, 74.

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APPENDIX I

Scoring Scale

I. *Wheels*

Item	*Description*
1. Both wheels present	more lines, circular or oval, more or less same size
2. Spokes present	any clear method of representing spokes heading towards the centre, no credit for horizontal parallel spokes
3. Spokes present (double set)	spokes shown crossing each other and touching the two ends of the hub (any one wheel)
4. Spoke-joints present	spoke-joints on the rim, indicated on either wheel
5. Valve-point present	any clear way of representing the valve-point for pumping in the air in the tube (either wheel)
6. Mudguard present	Semi-circular mudguard single dimension, both wheels, no credit if it is shown below the tyre
7. Mudguard present (double dimension)	semi-circular mudguard, double dimension, both wheels
8. Mudguard linking rods present	mudguard should be shown as linked with the hub-end, through one rod or two (any one side)
9. Hubs present	indication of hubs through a small circle, not by a point, where spokes meet (any one side)
10. Hubs present (three dimension)	circular ends and length of the hub should be indicated (see diagram)
11. Tyre present	indication of tyres by more circular or oval lines (both sides)
12. Tyre details present	details of tyre-rubber indicated

II. *Central Axle, Wheel and Chain*

13. Central axle present	central axle roughly in the middle of the two wheels near the rear wheel, shown through a solid circle
14. Central wheel inner supports present	supporting rods or lines, letters, etc., indicated

15.	Central wheel teeth present	teeth for suporting chain on the wheel shown (anyway)
16.	Central wheel in correct proportion	correct size of the central wheel (diameter nearly ¼ of the wheel), no credit if size is more than 1/3 of wheel
17	Central wheel on correct side	central wheel shown on the right side of the bicycle, it should be behind the frame-rods if the handle of the bicycle is on the left
18.	Chain present	chain shown going over the free wheel and the central wheel, no credit if chain is shown on two sides. If full chain cover has been drawn, chain should be taken as made. The concept of the chain should be credited whatever the form of the chain.
19.	Chain-links present	chain should be shown as made of individual beads or links which may be shown in dotted lines or small circular oval shaped beads or by any other method

III. *Pedals*

20	Pedals present	two pedals shown in any way, give credit for the concept
21.	Pedal connecting bars present	bars or rods, single or double line representation, should be in the same straight or parallel line
22.	Pedals present (two dimensions)	two dimension pedals shown connected with linking bars (21) pedals should be linked in the middle not on the side (see Fig. 3).
23.	Inner-pedal bars present	the three bars (side bars and the central bar) shown, either pedal
24.	Pedal rubbers present	pedal rubbers should be distinguished from central iron bars

IV. *Free-wheel*

25.	Free-wheel present	any way of indicating the free-wheel; concept to be credited
26.	Free-wheel support	free-wheel shown supported on interior solid circle
27.	Free-wheel teeth present	free-wheel teeth to suport the chain, indcated, may be in any form

28.	Free-wheel in correct proportion present	correct size of the free-wheel (diameter nearly 2/5 of the central wheel should be shown, no credit if its diameter is more than 1/3 of the central wheel)
29.	Free-wheel shown on proper side	free-wheel should be shown on the side of the central wheel

V. *Frame*

30.	Frame-line joining handle with saddle present	it may be of two types, straight in gent's bicycle and circular in lady's bicycle
31.	Frame-line joining handle with central axle directly	
32.	Frame-line joining handle with central axle through the handle perpendicular	give credit for Item 31 above also if it is through handle perpendicular
33.	Frame-line joining saddle with central axle	
34.	Frame-line joining saddle with the rear wheel (single railing)	
35.	Frame-line joining saddle with the rear wheel (double forcep type railing)	give credit for Item 34 above also if it is through double railing
36.	Frame-line joining central axle with the rear wheel (single railing)	
37.	Frame-line joining the central axle with rear wheel (double forcep type railing)	give credit for Item 36 above also if it is through double railing
38.	Two dimensions of any part of the frame shown	

VI. *Handle*

39.	Handle present	two arms bent at right angle, and a perpendicular emerging downwards from the middle
40.	Handle present (two dimensions)	two dimensions of the above

41. Frame-line connecting the handle with the front wheel through a single rod	
42. do	give credit for Item 41 above also if it is so
43. Hand supports present	shown in any manner
44. Lamp-stand present	if a lamp or dynamo shown, this item should be taken as present

VII. *Brakes*

45. Brake-lines with handle arms present	give credit if present on both sides
46. Brake-line for front-wheel present	mere line going down the perpendicular emerging from the handle
47. Brake-line for rear wheel present	mere line going along the lower limb of the frame
48. Brake shoe for front wheel present	do
49. Brake-shoe for rear wheel wheel present	socket for two rubber pieces
50. Brake rubbers, front wheel present	indicated in any manner
51. Brake rubbers, rear wheel present	indicated in any manner

VIII. *Saddle, Carrier and Stand*

52. Two-dimensional saddle present	
53. Three-dimensional saddle present	
54. Saddle springs or link rods present	
55. Saddle-frame joint present	
56. Carrier present	carrier shown lower than the saddle on rear wheel
57. Rods joining the carrier with hub present	carrier should be connected with hub through a single or double rod
58. Carrier details present	interior net structure should be shown
59. Carrier conected with frame	carrier should be connected with frameline linking the saddle with the rear wheel at a proper place

60	Stand present	any type of stand, single or double
61.	Two-dimensional stand present	give credit if two dimensions of the stand or springs are given and carrier is connected properly with the hubs
IX.	*Accessories and General*	
62.	A lamp or dynamo present	if a dynamo is shown, power producing gadget should also be available, otherwise give no credit
63.	Rear mudguard (red light) indicator present	
64.	Basket present	may be on the handle or by the side of the carrier
65.	small additional saddle present	
66.	Lock present	shown at the proper place
67.	Bell present	may be on either or both sides of the handle
68.	Chain cover present	may be full or half
69.	Pump present	may be on the cycle or shown separately
70.	Rubber piece on the front wheel mudgard present	
71.	Additional horn present	
72.	Toy wind-mail present	
73.	Side glass present	
74.	Idea of transparency	if the child has an idea of opaqueness and does not show covered parts (like chain under the mudguard), he should be given credit
75.	Action shown	the cycle should be either on the stand or it should be in action, i.e., someone sitting on it.

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Adaptation and Standardization of the Wechsler Intelligence Scale for Gujarati Children

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The author has translated, adapted and standardized Wechsler's intelligence scale for Gujarati children. For standardization a sample of 440 children (220 boys and 220 girls) was taken from 12 schools of Ahmedabad city. The split-off and test-retest reliabilities were calculated and the test validated against other standardized tests of intelligence in Gujarati. Factual validation, age-wise and sex-wise inter-test correlations were also determined.

On the one hand there are some widely used reliable and valid group tests of intelligence for upper age groups in Gujarati while on the other hand there is dearth of standardized individual tests of intelligence. Some clinics and schools for the mentally retarded use N.N. Shukla's adaptation of the 1916 Stanford-Binet scale. It is only the individual tests of intelligence that provide wider field for the psychological observation of various personality traits and give chances to peep into the covert aspect of the testee's behaviour and hence the need for the present work.

Basic Principles of Adaptation

Adaptation is not equivalent to translation. The American or

This paper is based on the author's Ph.D. thesis.

British tests based on their environments render the mere translation which is quite inadequate and undesirable. Even ordinary things like dress, domestic articles of everyday use, social customs, accepted social behaviour, ideals, normal school experiences and everyday experiences in general are totally different.

Every language has its own niceties and models of expressions which cannot be expressed through another language by mere tranlation. Every word has its specific significance, denotation and conotation which cannot be maintained by translating the word. Some words of one language may not have exact equivalents in another language. The sentence pattern of a particular language has also specific characteristics.

Moreover, the content of test-items of intelligence tests is usually based on the school experiences and the school subjects. The curricula and courses of studies in India, and other countries are much different and therefore the test based on the experiences of foreign children cannot be adequately translated for the Indian children.

Lastly, the difficulty value of a test in one environment cannot be the same in another and therefore such an adapted test must pass through the whole process of standardization involving a lot of statistical work, fixation of norms together with establishing reliability and validity of tests. Thus to adapt a test means to restandardize it after making suitable changes for cultural differences.

WISC consists of twelve sub-tests—six verbal and six performance. It covers eleven age groups (5+ to 15+) and gives wide scope for the display of testee's many-sided personality by exposing him to various types of performances.

While adapting the present scale the following factors were kept in view.

1. The successful functioning of each test involves some specific mental operations and processes. The sub-items of one test usually require the same mental operations and processes to some extent. Thus while coining the new items their underlying mental operations should correspond to the original one as far as possible.
2. The unfamiliar words; proper nouns; names of animals, things, cities, etc., and the names of articles, fruits, coins, vegetable

units of measurement, etc., were replaced by the familiar ones.

3. The unfamiliar content of the test was replaced by the familiar one based on Gujarati children's environment and experiences.
4. The sentence patterns were changed in such a way that the underlying meaning remained unchanged.
5. Language test like 'vocabulary' was framed anew.
6. Verbal tests were changed in such a way that the language and the content suited the testee's development and experiences.
7. The scoring scheme and the scoring standards were modified in the light of data collected through an adapted scale.
8. At the initial stage an item was replaced by two or three newly coined items so that the experimenter may later on get chances for comparative evaluation and proper selection.
9. As far as possible the difficulty level of the original items and that of the replaced ones were similar, yet the difficulty value of all the items was established on the data collected through the preliminary runs.
10. On the results of the preliminary runs, the reliability and validity of the newly coined items were established tentatively. They were finalized during the final run.
11. The language and the wording of the tests were also checked and rechecked during the preliminary runs.
12. Specific time limit for each item was established on the analysis of the data obtained through the preliminary runs.

WISC consists of the following twelve tests: (1) Information, (2) Comprehension, (3) Arithmetic, (4) Similarities, (5) Vocabulary, (6) Digit Span, (7) Picture Completion, (8) Picture Arrangement, (9) Block Design, (10) Object Assembly, (11) Coding A & B, (12) Mazes.

CHANGES MADE IN THE TESTS

First of all WISC manual was studied deeply and consciously with a view to making following changes.

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Changes Made in the Directions for Administering the Test

Language. Following the basic principles of test adaptation the names of all the twelve sub-tests and the directions for test administration were translated into Gujarati. During this process of translation, as far as possible word to word translation was tried out but following the common sense principles of translation, the niceties of language or underlying meaning were not sacrificed for the structural pattern. The specific verbal instructions to be given to the testees were translated into colloquial Gujarati maintaining the stress, emphasis, and feelings attached to them in the original battery. This process was carried out for all the twelve tests of the battery.

Item-Limit for 8+Children. This is a unique feature of WISC. Most of the tests in WISC give specific item-limit from where the subject of 8 years or more are to be tested. If they pass the prescribed items successfully they are credited for the former items. If the subject fails on any of the prescribed items he is to be tested on the former items and credited for only those on which he succeeds. Thus 8 years or older subjects are to be started from item 4 on Information and Arithmetic, item 5 on Similarities and Picture Arrangement, item 3 on Mazes and Block Design and item 10 on Vocabulary. General Comprehenseion, Digit-span, Picture-Completion and Object Assembly have no item limit for any age groups. Coding A is for subjects under 8 years age and coding B is for 8 years and older.

In the light of the changed items and the changed sample of standardization, these item-limits must be adapted so as to suit Gujarati children. They must be fixed on the analysis of the data collected through the responses of Gujarati children and therefore during the pre-pilot and preliminary runs all the subjects were tested from item 1.

Consecutive Failures. Another unique feature of WISC is the discontinuation of a test after the specific consecutive failures on its items. Thus Information and vocabulary tests are to be discontinued after 5 consecutive failures; General comprehension, Arithmetic and similarities after 3; Digit-span after failures on both the trials of a given series; Picture completion after 4; and Picture arrangement, Block Design and Mazes after 2. Object Assembly has no such limit and coding being speed test is imposed a time limit. It is natural that such a complicated procedure adopted by Wechsler for American population cannot be straightaway used with Indian children without preliminary tryouts. Thus during the preliminary runs such limits were also dropped out, and the testees were tested on all the items of all the tests.

Time Limit Prescript. Most of the intelligence tests, though considered power tests are allotted specific time-limit with a view to discriminating between the subjects of various intelligence levels. Accordingly Wechsler has imposed specific time-limit on all the items of six-performance tests together with Arithmetic test; but has avoided an over all time-limit for any test. Thus the prescribed time-limit for the items in Arithmetic ranges from 45 to 120 seconds. The time-limit for Picture Arrangement, Block Design, Object Assembly and Mazes ranges from 45 to 75, 45 to 150, 120 to 180 and 30 to 120 seconds respectively. Coding A and B are exclusively speed tests requiring 120 seconds each. Moreover bonuses in terms of scores are allowed for rapid performances on the items of Picture Arrangement, Block Design and Object Assembly. In view of the innovations and reinnovations made in the test items and changed sample of standardization such a complicated process of time allotment cannot be copied. It must be experimentally decided on the data collected from Gujarati Children. Thus during the pre-pilot and pilot runs no time-limit was imposed and all the testees were allowed to take as much time as they wanted to work on any item.

Changes Made in the Test Items

Of the changes made in the content of the test items here are a few examples:

In the Information test out of 28 items 18 items were changed. Thus the item:

1. 'How many pennies make a nickel?' was changed to "How many paise make a rupee ?"
2. Since Gujarati children may not be conversant with Shakespear's *Romeo and Juliet,* the item, "who wrote *Romeo and Juliet?*" was replaced by two items, viz., "Who wrote *Shakuntala* and, "who wrote *Ramacharita ?*'
3. The question, "Who discovered the South Pole ?" was tried

out together with the newly coined item, "Who discovered the Law of Gravity?"

In the General Comprehension test the item:

1. "What would you do if you were sent to buy a loaf of bread and the grocer said he did not have any more?" was changed to, "What would you do if you were sent to a shop to buy curd and if the shopkeeper said he did not have any more?"
2. The item, "Why do we elect Senators and Congressmen?" was changed to, "Why do we elect the members of Lok Sabha and Rajya Sabha?"

Most of the changes made in the Arithmetic test pertain to the American proper names and the names of the American currency. Thus pennies and cents were changed to paise and dollars to rupees. While making these changes the prices of the commodities in Gujarat were taken into consideration. The cultural and environmental differences compelled the changes in about 12 pairs of the Similarities test. WISC Vocabulary test consists of 40 words. There was no sense in translating the words and therefore an original test having 50 words was devised with a view to selecting 40 later on. The Picture Completion test consisting of 20 pictures was tried out together with the 10 newly drawn pictures. Out of the 12 sets of pictures in the Picture Arrangemen test 4 sets were redrawn so as to reflect the content in Indian background. No item in degit-span, block-design, object assembly, coding and mazes was changed.

Changes Made in the Scoring System

Verbal Tests. WISC manual gives various scoring systems for various items on all tests of its battery. Information, arithmetic and digit-span are scored either 0 or 1 depending on the correctness of the answer. The correct responses on comprehension, similarities and vocabulary are scored as 0, 1 or 2 depending upon the generalization and quality of the answer. Clarity of thought and richness of content are taken into consideration and credited. WISC manual gives the criteria for scoring and sample answers together with the general rules of scoring and the typical marginal sample responses which are to be scored 0, 1 or 2.

During the process of adaptation the tentative scoring system based on these principles was prepared. The sample answers were translated and other possible answers were thought out at the out-set so that they can be helpful in later evaluation. Specific sample answers were also thought out and listed at all the levels of scoring for the newly coined items in information, comprehension and similarities. Vocabulary being an originally prepared test, no sample responses were translated but the general scoring principles given by Wechsler for 2-point responses, 1-point responses and 0-point responses were translated A tentative list enumerating sample answers at all these three levels, based on the meanings given in standard Gujarati dictionaries was prepared.

Performance Tests. The scoring of the responses on these tests is quantitative. The possible score per item ranges from 0 to 9. The Picture completion test is scored either 0 of 1 for the correct or incorrect pointing out of the missing part. The scoring of the items on other five performance tests depends mostly on the time taken by the subject to complete them correctly. Bonus scores are given for rapid correct completion. The range of time and that of scores varies from item to item and from test to test depending upon the nature of the task and its difficulty. Younger children are given more than one trials and scoring differs from trial to trial. Scores are given for the partial arrangement in the Object Assembly test. WISC manual gives all these complicated procedures and scoring system in detail. Though these things were translated during the adaptation, the final decision regarding the time-limit, bonus scores, etc., were deferred to time when the analysis was done on the data collected through Gujaarti population.

Preliminary and Final Tryouts

The manuscript of the newly adapted scale describing the detailed directions for test administration, test items and scoring system together with the acceptable answers was ready. Record books were prepared for the use during the preliminary tryouts.

Prepilot Run. With a view to getting subjective judgements and preventing many of the ills, the tests were given to seven adults. It gave insight as to the way in which adults look towards the questions. The tests were administered to 11 children of the age groups of 5 through 15. For the editorial review, the manuscript was given to two experts for their criticism. As a result of these three-fold attacks some changes were made in the process, items and the language of the tests.

The First and Second Preliminary Runs. Printed booklets were ready after making the necessary changes. The two preliminary try-outs were carried out with the following objectives in mind: (1) To see the adequacy of the range of applicability of the scale, (2) to standardize the directions of test administration and the instructions to be given to the testees; (3) to see the fitness of the test items from the point of view of wording; (4) to fix up the item-limit for 8+children and time-limit for various items in various performance tests; (5) to establish the difficulty and discriminative indices together with the validity of each item; (6) to standardize the scoring system and acceptable answers; and (7) to get practice in the administration of the scale.

Regarding the sample selection for both the trials two points were kept in mind, (1) kind, and (2) size. Regarding the kind of the sample it should closely resemble the population for which the test is to be standardized. Regarding the size of the sample many factors play their part. The administration of the present scale took about three hours per testee, as all the items were to be individually administered without any time limit. Individual testing requires some special facilities and arrangements too. To take care of these factors, a sample of 37 pupils for each run (the number has its significance for item-analysis) covering the age groups of 5 through 15, representative of the population to be finally tested, was selected.

Timing the Items. All the items on 7 out of the 12 WISC tests are imposed specific time limits. During the preliminary runs full-time was given to all the subjects to be able to solve all the items of these tests. The time taken by every child on each of the items was recorded in the booklet. After the booklets were scored, they were arranged in a rank order, the one with the highest score getting the first rank and one with the lowest score getting the last rank. The tables were prepared showing the time taken by all the 74 pupils (groups of 37 each) on each of the items and the new time limits were established for all the items in the light of the highest and the next highest time taken together with the original time limit given by Wechsler. The unique feature of some of the performance tests is the bonus scores for rapid correct performances. This aspect was decided by tabulating the time-data with respect to the original bonus scores given by Wechsler and the others newly suggested time-bonuses. Similarly the scores to be given for partial arrangements were also decided by tabulating the time-data in various frequency distributions.

Item Analysis. The reliability and validity of any test depends upon the quality and merits of individual items which constitute it. The procedure through which these aspects are studied, is known as item analysis. During this process each item is evaluated against its difficulty and discriminative values. The biserial correlation coefficient between each item and the total score is the most satisfactory measure of relationship for internal consistency item-analysis purposes. Their computation required laborious statistical calculations. With a view to minimizing the labour Kelley T. L. demonstrated that lowest and the highest 27 per cent of a sample are the optimum groups for use when item-analysis data are to be obtained. He pointed out that these groups are oridnarily most serviceable for use in item-analysis even when the items are to be scored only as 'true' or 'false' and all of them are not of 50 per cent difficulty value. In fact the correlations estimated from these 27 per cent tails are found more reliable than even the tetrachoric estimated from the top and the bottom halves of the group. Flanagan (1936) used the method described by Kelley and constructed tables for estimating the product-moment correlation from the 27 per cent tails of the distribution. Davis desired to give such an index of item discriminating power as can be truly comparable from item to item and which can be easily interpreted and conveniently used. Thus he preferred Fisher's z function as a linear function of the hyperbolic are tangent of the product-moment r. He thought it as a highly desirable statistic to use while expressing the extent to which an item discriminates between two defined criterion groups. Thus he used Fisher's z and translated Flanagan's non-linear into a linear scale representing discriminative values. For the sake of convenience he eliminated decimals from discrimination indices and arranged them from 0 to 100. He added the index of difficulty value in his table, so that both the discriminative and difficulty values of an item could be read at a time. The difficulty index given by Davis is based on a linear transformation of the per cent passing. Fan doubted the accuracy of the per cent passing value calculated in this manner and used Pearson's tables for estimating the P values for various levels of item criterion correlation. Harper, Sangal and Gupta (1962) prepared a chart where they plotted Davis's discrimination index directly from his table while used the difficulty values from Fan's difficulty P's by translating them into Davis's linear difficulty index. In the present work it was decided to follow this method designed by Davis and to use the chart prepared by Harper, Sangal and Das Gupta as Wechsler has not mentioned any method of item analysis either in WAIS or WISC manuals or in his book *The Measurement and Appraisal of Adult Intelligence.*

Thus on the basis of the total score on the whole scale, all the booklets were divided into three groups: (a) the 27 per cent scoring the highest, (b) the 27 per cent scoring the lowest, and (c) the middle 46 per cent. The middle 46 per cent booklets were discarded as item analysis procedure was carried out with the highest and the lowest 27 per cent of the group. The lowest booklets were numbered L-1, L-2 ...L-n and the highest ones were numbered U-1, U-2...U-n. Each booklet was gone through with a view to noting down the correctly or otherwise answered items and the totals were calculated per item. The data was ready for the calculation of P_l (Percentage of the low group) value and P_h (Percentage of high group) value for each item. Interpretation of any item indices partly depends on the method used for calculating P_h and P_l values. As in the present scale there are neither alternative answers, nor free responses, neither 'chance success' nor distractors, nor the question of 'not reaching the item', the following formula for uncorrected percentage was used for calculating P_l and P_h values.

$$P = \frac{\text{Number answering item right}}{\text{Number attempting item}}$$

The difficulty and the discriminative indices were read from the chart and the respective tables for all the test-items were prepared. Item-selection was made on the readings and interpretations of these tables

Item Limits for 8+Children and Consecutive Failures. Seven out of 8 WISC tests are imposed with 8+item limits. During the first preliminary run no such limit was observed. As the items were rearranged according to their difficulty and discriminative indices after the first preliminary run, during the second preliminary run this aspect was considered and its adequacy was looked upon by tabulating and studying the respectvie data. Similarly the consecutive failures on each test after which the test is to be discontinued, was also decided during the second preliminary tryout, by tabulating and studying the respective data. Though the items were timed after the first run, during the second run, time taken on each item was recorded, tabulated and studied with a view to making the necessary changes needed. At the end of the second preliminary tryout all these features—consecutive failures, 8+limit, bonus scores, scores for partial arrangements, trial tests, scoring standards, scoring schemes, etc., were finalized.

Final Tryout: *Sample Variables.* Record booklets were printed for the final tryout. With a view to selecting the representative sample the following variables were kept in mind: (1) In view of the time and facilities required for administering an individual test of intelligence the test was standardized on 440 children—220 boys and 220 girls—of Ahmedabad city. (2) It is standardized for the children of ages 5+to 15+ studying in Grades I through XI. (3) Forty children (20 boys and 20 girls) were equally distributed amongst the eleven age groups. No attempt was made for right age in right grade. (4) Each child was tested within one and one-half months of his year. (5) Parental occupations of the subjects were taken into consideration. The national classification of industries and occupations adopted by the Government and followed by 1961 census gives the ten categories of industrial workers. For the purpose of the present study, the ten categories were reduced to six and it was tried to maintain proportionate representation of each category in the selected sample. Twelve schools representing the upper, upper-middle, lower-middle and lower classes, situated in various areas of Ahmedabad city and considered as representatives of the whole school-going population were selected for drawing the sample. Tables 1, 2 and 3 give the sample analysis from various point of views. The work of testing and scoring was done by the researcher herself and it took about two years for her to complete them.

TABLE 1

Age-wise and School-wise Distribution of the Sample

School	Age Groups											Total
	15+	14+	13 +	12+	11 +	10 +	9+	8 +	7+	6+	5 +	
1. C.N. Vidyalaya	5	5	5	5	4	6	3	7	5	4	4	53
2. A.G.H.S.	5	6	4	5	5	7	3	6	5	5	5	56
3. D.B.H.S.	4	7	4	6	5	7	5	8	6	7	3	62
4. Jai Hind H.S.	1	4	6	3	5	2	8	4	1	3	—	37
5. New H.S.	8	6	7	5	7	5	4	—	—	—	—	42
6. Unnati H.S.	7	2	4	6	4	4	2	1	—	—	—	30
7. R.B.R.C.H.S.	7	5	6	6	5	4	3	—	—	—	—	36
8. R.B.M.K.H.S.	3	5	4	4	5	5	6	—	—	—	—	32
9. Unnati Kumar Shala	—	—	—	—	—	—	—	3	6	2	9	20
10. Bal Rangam	—	—	—	—	—	—	2	6	7	4	14	33
11. Bal Vidyalaya	—	—	—	—	—	—	3	5	4	2	3	17
12. D.A. Vidyalaya	—	—	—	—	—	—	1	—	6	13	2	22
Total	40	40	40	40	40	40	40	40	40	40	40	440

TABLE 2

Age-wise and Grade-wise Distribution of the Sample Selected

Ages	Grades												Total
	XI	X	IX	VIII	VII	VI	V	IV	III	II	I	Talim	
15 +	25	11	4										40
14 +	6	21	10	3									40
13 +	1	5	16	14	3	1							40
12 +			4	24	10	2							40
11 +				5	23	11	1						40
10 +					3	22	15						40
9 +						2	29	7	1	—	1		40
8 +							3	24	13				40
7 +									22	12	6		40
6 +										22	18		40
5 +											31	9	40
Total	32	37	34	46	39	38	48	31	36	34	56	9	440

TABLE 3

Sample by Paiental Occupations

*Occupational Groups**	*Employed Persons in Ahmedabad*	*Present Sample*	*Proportionate Representation*	*Present Sample*
I	6.53	9.10	29	40
II	10.00	12.05	44	53
III	13.43	14.32	59	63
IV	5.32	7.27	23	32
V	55.42	50.00	244	220
VI	9.33	7.27	41	32
Total	100.03	100.01	440	440

*A consolidation of eleven census groups, 1961.

TEST STANDARDIZATION AND RESULTS

Test standardization is a continuous process beginning with the preparation of test items, then passing them through the stages of preliminary tryouts, item analysis, final tryout of the test on a properly selected sample and ending with the establishment of the norms. Establishing norms for a particular population is nothing but evaluating test results so that the performance of any testee can be easily compared with that of the whole group.

Establishing Scaled Scores

After testing and evaluating all the booklets, their raw scores in all the 12 tests were obtained. The present scale being the point scale an individual's intelligence rating was obtained by adding together the points that he earns for passing various test items. The present scale consists of 12 tests having items ranging from 4 (object Assembly) to 93 (coding B). The possible maximum credit that a testee can obtain in various tests ranges from 16 (arithmetic) to 93 (coding B). In such a scale the main problem to use the statistical term is that of 'Weighting'. Weighting means to decide as to the portion of the total number of credits that each of the test should be assigned. Generally two methods are practised. (1) Uniform weight is given to each item, so that the whole test gets a weight in proportions to its items. One point (or more as the case may be) is allowed for each successfully passed item irrespective of the number of items in the test. The composite scores of all the tests is to be used for further standardization. (2) The uniform weight method, one used by Otis and Wechsler, where all tests are considered as equal irrespective of the numbers of items therein. In such a method a predetermined scoring system is established which determines in advance the proportion that each test contributes to the total score. The second method was adopted for the present standardization because: (1) It is in confirmation with Wechsler's theory of intelligence according to which intelligence is 'assortive' rather than 'hierarchical'. (2) When various types of tests are included in the scale, it means that all of them are equally necessary for the comprehensive measurement of intelligence and they must be equally weighted. (3) The method does not penalize individuals having limited aptitude (or favours those having special aptitude) for the type of performance called for by a given test. (4) The weight allocated to any single sub-test in a scale does not ordinarily affect the total score to any significant degree. (5) The method permits the examiner to evaluate all the tests separately. (6) Such a procedure of uniform weighting allows for the addition or omission of one or more tests from the scales without significantly affecting or altering the norms.

Method of Equating the Sub-tests

As the highest possible raw score on various WISC tests ranges from 16 points (arithmetic) through 17, 20, 21, 28, 30, 34, 50, 55, 80, etc., to 93 points (coding B), scores made by individuals on several tests cannot be compared directly owing to differences in test units. The only way is to reduce the raw scores for each test so as to have a suitable scale for our purpose. Such reduced scores are known as σ scores or z scores or standard scores. As such scores are expressed in terms of the deviations from the mean, they are easily comparable and secondly they do not change the shape of the original distribution in any way. The mean of σ scores is always 'o' which is a reference point and as half of the σ scores lie above the mean and half below the mean, half of them will be positive and half will be negative. Moreover σ scores sometimes result in small decimal fractions which on their part create computational difficulties and awkwardness. These aspects are avoided by usually converting the σ scores into a new distribution with M and SD so selected as to make all scores positive and relatively easy to handle. Thus in the present work a scale of 20 points for each subject was selected and accordingly the raw scores of each test were converted into the scaled score units with a new mean of 10 and a new standard deviation of 3. As the WISC has 12 tests, the converted full scale came to be of 240 points and the Verbal and Performance scales came to be of 120 points each. The newly established SD of 3 also eliminates negative scores below the mean. The ratings and calculations of the IQs and the establishment of the norms are based on these converted scaled scores of 440 boys and girls ranging from 5+through 15+.

The conversion of the original raw scores into new scaled scores was accomplished through the following steps: (1) Cumulative frequency distributions of raw scores were prepared separately for each test and at each age level. (2) The mid-points of score intervals were then fixed, which were further expressed in terms of per cents of umber of pupils. (3) The per cents were directly turned into scaled scores in a distribution of M=10 and SD=3, by means of a table given by Garret (p. 446), presenting per cents lying between the mean and a given standard deviation. The resulting numbers were the corresponding equivalent scaled scores for the original raw scores. All these steps were necessary in order to set each percentile point at its appropriate standard score value of a theoretical normal curve. With a view to observing the progression of these scaled score equivalents from age to age, they were listed test-wise in parallel columns for all the eleven age groups. Minor irregularities in the progression of scaled scores from age to age were smoothed with the assumption that they were the chance results of population sampling.

Norms and Calculations of IQs

Norms are averages obtained under prevailing conditions. WISC consists of twelve tests—six verbal and six performance. It gives Verbal IQs based on verbal scaled scores, Performance IQs based on performance scaled scores and Full IQs based on full scaled scores. As the mean of the new scaled score per age, per test was fixed as 10, the means of the six verbal scaled scores and six performance scaled scores should be approximately 60 each, and that of the full scaled scores should be approximately 120. This aspect was checked before establishing norms and giving IQ tables. Table 4 gives the results.

TABLE 4

Age-wise Scaled Score Means and SDs

Age Group	*No. of Subjects*	*Verbal*		*Performance*		*Full*	
		Means	SDs	Means	SDs	Means	SDs
5 +	40	60.75	10.55	59.37	11.55	120.00	19.50
6 +	40	60.10	14.50	60.75	12.60	120.50	25.50
7 +	40	59.87	13.20	60.25	13.20	120.25	24.60
8 +	40	59.87	12.20	60.37	12.90	120.00	23.80
9 +	40	59.50	11.95	59.63	11.80	118.50	21.40
10 +	40	59.87	12.70	59.50	11.80	119.50	21.90
11 +	40	60.12	12.15	60.75	11.55	120.00	20.10
12 +	40	59.38	13.85	59.75	13.10	118.75	23.80
13 +	40	59.38	16.00	60.50	13.20	122.00	25.90
14 +	40	60.63	14.55	59.50	11.90	120.50	24.40
15 +	40	60.12	12.70	59.50	11.35	119.25	21.20
Total	440	60.05	13.305	60.01	12.35	119.89	23.04

The concept of MA was introduced by Alfred Binet. Though IQ as an index of brightness was first suggested by Stern and Kuhlmann (1912), it was actually used as a part of test findings when the 1916 Stanford-Binet Revision was made available. It is the ratio of mental age to chronological age multiplied by hundred in order to remove fractions. The mental age without reference to the chronological age has not value because persons of different chronological ages may and do reach the same level of mental age at a given time. Thus the value of IQ concept lies in the fact that it reflects these age differences and furnishes us with a method of defining relative intelligence.

Deviation IQs. The interpretation and use of IQs created number of problems because it is taken as an index independent of the score made by an individual on a particular scale at a particular age. This is the concept known as the constancy of IQ, which means that the relative brightness of an individual is more or less permanent. Now for the IQs to be constant the means and the SDs at various age levels should be constant. It was found that the SDs of IQs obtained by MA/CA were not always identical for all ages. For example it can be 12 at one age level, 16 at other and 18 at still another. These differences affect the interpretation of IQ at a given level. Thus, e.g., persons of different ages having different IQs like 112, 116 and 118 are all at+1 SD in their respective groups; or one person having constant IQ will occupy different relative positions at different age levels. Wechsler introduced the concept of Deviation IQ and overcome the difficulty. He states the usual formula IQ=MA/CA as IQ=attained or actual score/expected mean score for age. This index of deviation IQ is merely an adaptation of standard score (z score) technique, where a mean score is given a deviation IQ value of 100 and the SD of the score is equated with a deviation IQ value of 15. Thus a person getting 115 IQ will always be placed at +1 SD in the group irrespective of his age. Instead of 100 and 15 any numerical value can be selected. It is only due to convention that 100 is taken as normal IQ and 15 or 16 are the probable SDs found in most of the intelligence tests. Moreover this deviation IQ is especially found useful while estimating an adult's level of intelligence and does not create any problem while calculating and explaining the IQs of superior or gifted children.

In the present work it was decided to take mean IQ 100 and SD 15. The conversion of the respective scaled scores (verbal, performance, and full) into respective IQs (verbal, performance, full) was then simply a process of setting the mean of the obtained scaled scores on the six verbal tests equal to 100 verbal IQ and the SD of the obtained scaled score on the six verbal tests equal to 15. The other conversions were made accordingly. Similarly the mean of the obtained scaled score on the six performance tests was taken as equal to 100 performance IQ and the SD as equal to 15. The same process was followed while transforming the full scaled scores into full IQs. The following formula was used for the purpose of conversion:

$$X' = \frac{\sigma'}{\sigma}(X-M)+M'$$

The obtained means and standard deviations for the three scaled scores were found as shown in Table 5.

TABLE 5

Means and SDs of Scaled Scores

Scaled Scores	*Mean*	*SD*
Verbal Scaled Score	60.05	13·305
Performance Scaled Score	60.01	12.35
Full Scaled Score	119 89	23·04

When the respective values were entered in the formula the corresponding equations came to be

$$1.\quad \text{Verbal IQ} = \frac{15}{13.305}(60-60.05)+100$$

$$2.\quad \text{Performance IQ} = \frac{15}{12.35}(60-60.01)+100$$

$$3.\quad \text{Full IQ} = \frac{15}{23.04}(120-119.89)+100$$

60.05, 60.01 and 119.89 were considered as 60, 60 and 120 respectively as the rounding up does not affect the final calculations of IQs significantly. It was on this line that the tables for converting scaled scores into respective IQs were prepared. As the usefulness of any scale depends upon the distribution of IQs, figures and tables showing the age-wise, sex-wise and group-wise distributions of verbal, performance and full IQs were prepared.

Wechsler compared the psychologist's effort at classifying intelligence with that of layman's at distinguishing the colours of the rainbow (p. 38) and insisted on fixing up the classification on the basis

TABLE 6

Intelligence Classification of Full IQs (Theoretical and Actual)

Classification	*IQ Limits*	*% included (Theoretical)*	*% (Actual)*	*No. of Testees*
Defective	69 & below	2.15	3.18	14
Borderline	70-79	6.72	5.91	26
Dull-Normal	80-89	16.13	13·86	61
Average	90-109	50 00	50·45	222
Bright-Normal	110-119	16.13	18·64	82
Superior	120-129	6.72	5·68	25
Very Superior	130 & above	2 15	2·27	10
Total				440

of obtained IQs by attempting to base the categories on explicit statistical criteria (p. 40). Table 6 gives the theoritical classification of IQs given by Wechsler (p. 41) together with the actual one obtained in the present study.

THE RELIABILITY AND VALIDITY ESTIMATES

The reliability of the present scale was calculated by (1) Split-half technique, and (2) Retest method using the same test. The split-half reliability was calculated for 7+, 10+ and 13+ age groups, considering them as representative of the age-range for which WISC is standardized. Appropriate correction for full length of the test was calculated by Spearman-Brown formula. The standard error of measurement and Index of Reliability were also calculated. The results are presented in Table 7. The table does not show any entry for the Coding test because this technique could not legitimately be used for estimating the reliability of that test which is essentially a speed test. As the Digit-span test was administered as two separate sub-tests—Digit Forward and Digit Backward—the reliability coefficients shown

TABLE 7

Reliability and Standard Error of Measurement

Test	*Age*	*7+*	*Age*	*10+*	*Age*	*13+*	*Retest*
	r	SEm	r	SFm	r	SEm	r
Information	.876	1.09	.773	1 40	.809	1.55	.97
Comprehension	.639	1.78	.773	1.51	.788	1.34	.90
Arithmetic	.876	1.06	.837	1.19	.809	1.54	.85
Similarities	.837	1.10	.802	1.43	.809	1.43	.87
Vocabulary	.693	1.27	.913	0.84	.773	1.44	.95
Digit Span	.639	1.83	.690	1.72	.630	2 05	.81
Picture Completion	.814	1.35	.758	1.53	.857	1.33	.87
Picture Arrangement	.889	0.91	.788	1.37	.809	1.43	.88
Block Design	.810	1.29	.857	0.99	.837	1.27	.93
Object Assembly	.974	0.51	.742	1.55	.780	1.84	.87
Mazes	.889	0.93	.901	1 03	.817	1.16	.88
Verbal Score	.901	5.08	.947	3.56	.958	3.84	.98
Performance Score	.913	4.66	.936	4.04	.936	3.98	.97
Full Score	.947	3.63	.958	2.97	.969	3.02	.99
Coding	—	—	—	—	—	—	.82

The SEm is in Scaled Score units for the individual sub-test and in IQ units for the Verbal, Performance and Full Scores.

are based on the correlation between scores on two sub-tests corrected according to the Spearman-Brown formula. For the composite scores (verbal, performance and full) the sum of the scores on odd items in the contributing tests were correlated with the sum of the even items. The reader of Table 7 should not be confused by the discrepancy between the size of the SEm for the individual tests, as contrasted with the SEm for verbal, performance and full scale IQs. For individual tests, the SEm is in scaled score units, while for the IQs they are in IQ units, which are the ones in which most test users are interested. Forty testees were retested after an interval of six months, within a period of one month. The Product-moment *r* for each test was calculated by correlating the scores received by the testee on two trials. Table 7 shows the results.

Operational validity and predictive validity are the two general types of validities. Face validity, content validity, factorial validity, construct validity, concurrent validity and cross validation are the various forms of operational validity. There is no need here of discussing

TABLE 8

Correlations with Other Validating Criteria

Criteria	*WISC IQ*			*Sample Number*
	Verbal	*Performance*	*Full*	
1. Stanford-Binet Intelligence Scale (1960)	.653	.653	.733	30
2. Desai Group Tests of Intelligence	.729	.517	.697	55
3. Bhatt Group Tests of Intelligence	.701	.789	.867	57
4. Desai-Bhatt Group Tests of Intelligence	.679	.476	.682	50
5. Shah Non-Verbal Group Tests of Intelligence	.499	.645	.682	87
6. Draw-A-Man Test	.484	.455	.527	105
7. Non-Verbal Group Tests of Intelligence—Bhavsar	.546	.672	.712	40
8. School Marks	.559	.203	.421	110
9. Teachers' Ratings : Grades V, VI & VII	.676	.521	.686	66
10. Teachers' Ratings : Grades VIII, IX, X & XI	.610	.451	.656	71
		Coding B		
		Numbers	*Named*	
11. Speed and Accuracy Test		.519	.514	17

all these types of validation that was carried out. I am only presenting the results of correlating the IQs obtained on the present scale with those obtained on other well standardized tests in Gujarati and with other criteria like school marks and teachers' ratings. The results are presented in Table 8.

The internal validity of a test requires that all the sub-tests should correlate highly with the total score obtained on the scale, while they should correlate moderately with each other. The reason behind the theory is that when all the sub-tests correlate highly with the whole test, they measure essentially the same thing. On the other hand the moderate interest correlations show that they measure various aspects of the same criterion. This being the essential step before beginning the factorial analysis, age-wise and sex-wise inter-test correlations were calculated for all the age groups. Factorial analysis was carried out on the 50 booklets (25 boys and 25 girls) selected at random from each age group. Table 9 gives the principal factor loadings.

TABLE 9

Principal Factor Loadings of the Tests and their Correlations with Verbal, Performance and Full Scores

Test	*Factor Loadings*	*Correlations with Scores*		
		Verbal	*Performance*	*Full*
Information	.940	.936	.893	.932
Comprehension	.938	.942	.887	.929
Picture Completion	.922	.844	.916	.900
Vocabulary	.906	.969	.861	.930
Object Assembly	.901	.848	.909	.898
Mazes	.902	.820	.887	.874
Arithmetic	.889	.859	.838	.867
Similarities	.886	.928	.833	.897
Picture Arrangement	.884	.824	.889	.880
Block Design	.875	.826	.902	.885
Coding	.800	.769	.849	.828
Digit-Span	.769	.715	.715	.729

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A Follow-up Study of Examination Reforms in the Gauhati University

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In 1963 the Gauhati University introduced certain reforms in its examination system. The study discussed here is a preliminary attempt to find out to what extent these measures have improved the accuracy of examination marks. This has been investigated under two heads: chance errors, and constant errors. The study suggests that the chance errors are smaller in the reformed examination. Under the head 'constant errors' the influence of scaling has been studied and it is inferred that the examination reforms in the Gauhati University have improved the accuracy of marks. The author also discusses the limitations faced by researchers who attempt to investigate the influence of the examination reforms.

The importance of examinations in our public life is well known. They are often considered the sole criterion for judging a man's competence for various activities. If examination marks are not reliable, the judgment based on marks will be erratic. It is therefore necessary that marks have high reliability, that is, measurement errors in marks are nominal.

The poor reliability of traditional essay-type tests has been demonstrated by several studies both in India and abroad. Various suggestions have been put forth to improve them. Many feel that we should replace traditional eassy-type tests with new-type tests. Others hold that we should first try to improve traditional essay-type tests rather than going in for a sudden replacement of them with other types. However, it is admitted by all that the progress in either direction has been slow.

At the initial stage of its examination reforms, the Gauhati University concentrated on improving traditional essay-type tests. These tests by and large are subjective exercise. Any attempt to improve them would naturally aim to reduce errors assumed to be associated with subjective judgment. Research has shown that subjective judgment suffers from several weaknesses.

An examiner generally tends to give students with whom he feels some sort of ego-involvement marks higher than they deserve. The examiner who tries to avoid this effect tends to have a 'lean-over-backward effect' giving such students marks lower than they deserve. The Gauhati University has now introduced a system of anonymity in scripts. The practice of indicating the type of candidate, i.e., regular, male, etc., on the cover of the scripts has been abolished. The only information about the candidate that the script contains is his Roll Number. It is expected that this reform would eliminate the 'ego-involvement error' in marking.

Another error in marking is what we may term as 'central tendency error'. That is, examiners tend to cluster marks near the assumed average value for all the candidates. If an examiner gets scripts from a good institution where only high achievers are admitted, he would on the whole give lower marks to the students than they deserve. On the other hand, if he gets scripts from a poor institution, he would on the whole give higher marks to the students than they deserve. Now for major examinations the examination area is divided into several administrative zones. The scripts of each zone are randomised before they are sent to examiners. Thus every examiner is supposed to get a representative sample of the total examinees in the Zone. It is expected that this procedure would reduce the 'central tendency error'.

Some examiners are strict and some are lenient. To ensure that students do not significantly gain or lose due to strictness or leniency of a particular examiner, the raw marks are scaled before they are tabulated.

PROBLEM

The present study is a preliminary attempt to find out to what extent the above-said reforms have improved the accuracy of examination marks.

DESIGN OF THE STUDY

To investigate the influence of some reforms in an examination system we need to have two similar groups of students. One (the control group) group should take the examination *without* the reforms, the other (the experimental group) *with* the reforms. The influence of the reforms may then be studied. For obvious reasons, we cannot have such two groups for any public examination. Thus a reasonable approach to analyse such seems to compare the accuracy of marks of the improved examination with that of another examination which but for these reforms is similar. We therefore selected English I of the School Final (S.F.) Examination, 1957 of the Board of Secondary Education, West Bengal and English I of the Pre-University (P.U.) examination of the Gauhati University. Several considerations prompted us to select the two examinations: Prior to the establishment of the Gauhati University the students of both Bengal and Assam States took the same Class X (Matriculation) examination. As a consequence even now when Assam is having its own examinations, the pattern of question papers and the procedure of examination is virtually the same as in Bengal (but for the above-stated reforms in the P.U. examination). The content coverage in English I in both the examinations were similar. Both included questions on the prescribed textbooks. The two being public examinations, it may be safely assumed that in none of the two there was significant use of malpractices, and the time allowed in both were adequate for writing the answers, i.e., the tests were not speeded. The reliability figures for the two examinations have been reported (Gayen *et al.*, 1962; Misra, 1968). For other public examinations such figures are not available.

Several Indian studies (Taylor, Tluanga, and Misra, 1966; Harper and Misra, 1967) suggest that large public examinations have built-in reliabilities that remain fairly constant from year to year unless forced to be changed by some change in the examination system.

SAMPLE

A random sample of 191 cases selected from the Tezpur Zone of the P.U. examination, 1963 of the Gauhati University was used for this study. This sample was compared with 861 sample of the S.F. examination studied by Gayen *et al.* (1962), which may be considered a stratified sample from the S.F. examination, 1957.

CONCEPT OF ACCURACY IN EXAMINATION MARKS

The accuracy of any measurement may be defined as the closeness of the observed and true measurements. The difference between the observed and the true measurements may be defined as error. All the measurements have some amount of error, and educational measurements are no exception. The measurement errors are of two types, chance errors and constant errors.

I. *Chance Errors*

Chance errors are those which are sometimes positive and sometimes negative, sometimes high and sometimes low. About chance errors some assumptions seem reasonable. Chance errors will be random, so the mean of such errors will be zero, and there will be no correlation between the errors, and between the errors and true marks. It is obvious from these assumptions that the amount of chance error in a particular student's mark is not measurable.

There are certain statistical indices which tell us about the amount of chance error in a test. (*Note*: None of them tell about the amount of chance error in an individual mark). Of these indices, most widely used are the reliability coefficient and the standard error of measurement. For the purpose of the present study we shall consider only these two indices.

A. *Reliability coefficient*

Concept. The concept of reliability[1] of examinations has been discussed in detail in Misra (1968). Briefly, reliability coefficient answers such questions as: How accurately does the test measure whatever it does measure? What would be the correlation between the marks of the students if they were tested again using a parallel[2] test?

Types of reliability. Various types of reliability have been discussed in detail in Misra (1968). For convenience we shall group them in three categories: (1) Examiner reliability, that is, the correlation between the marks given to the same set of scripts by two competent examiners; (2) Content reliability, that is, the reliability of an essay-type test corrected for attenuation due to examiner reliability. This would be the correlation between two parallel essay-type tests if examiner reliability for both the tests were 1.00; (3) Total reliability, that is, the correlation between the marks given by two parallel examiners to two parallel essay-type tests. If two parallel essay-type tests are not availabl this could be estimated by multiplying the figures of examiner and content reliabilities. (*Note*: it is total reliability of essay-type tests which may be considered as analogous to 'reliability' as is generally spoken of objective tests. This is the reliability coefficient which indicates the degree of confidence that may be reposed in marks awarded in an essay-type examination).

Extrinsic factors influencing the estimate of reliability: The reliability coefficients depend also upon various factors other than the intrinsic agreement between two measures. It partially depends upon the method used to determine it. The reason is that various methods employ different assumptions. It also depends upon the ability range of the examinees. If this ability range is small, the reliability estimate

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In the strict technical sense it is the measurement and not the measuring instrument which is considered to have the property of reliability. Thus it is the reliability of marks rather than of the test. However, though technically objectionable, the concept of test reliability has a wide usage. Hence in this paper we have used 'test reliability' as interchangeable with 'marks reliability'.

[2] Gulliksen (1950) statistically defines parallel tests as 'tests with equal means, standard deviations, and intercorrelations'. Operationally parallel tests may be defined as 'tests built by the same procedure and to the same specifications' (Thorndike, 1963).

will be low, if large, it will be high. The length of the test is also a dominant factor in the determination of test reliability. If the test length is increased, the test reliability will increase. Conversely, if test length is decreased, the reliability will decrease. Besides, other factors, e.g., testing conditions, guessing by the examinees in answering questions, use of malpractices in examinations. speediness of the test, etc., influence reliability estimates.

Correction for the influence of the extrinsic factors. Since extrinsic factors influence the reliability estimates, a correction needs to be made for the influence of these factors in comparing two reliability estimates. For the present case it seems reasonable to assume that testing conditions were approximately the same for the two examinations. It may also be assumed that guessing of probable answers, use of unfair means, and speediness in tests were negligible in both the examinaitons. Test length for both the examinations was the same, i.e., three hours. However, the ability ranges of the two samples as indicated by the standard deviations are significantly different. For the S.F. examination sample the number of cases was 861 and the standard deviation was 12.03 out of 100 marks. For the P.U examination sample the two figures are 191 and 8.57 respectively. If there is evidence to suggest that ability ranges as measured by the two tests are similar, a correction in the reliability estimates has to be applied for the difference in the ranges of ability in the two samples. A preliminary analysis of the P.U. examination in English I showed the ability range for the Zone from 5 per cent to 82 per cent marks. The ability range for the S.F. examination (English I) is reported (Gayen *et al.*, 1962) from class interval 0-9 to 70-79. This shows that the same scale is used for both the examinations and both the tests are capable of testing the same range of ability. The difference between the two standard deviations seems due to the fact that the P.U. sample happened to be peaked and the S.F. sample platykurtic. Application of the difference in the ability ranges on the two samples therefore seems in order. The formula for the correction is

$$\frac{s}{S}=\sqrt{\frac{1-R_{11}}{1-r_{11}}}$$

where s is the standard deviation in the less variable group,
S is the standard deviation in the more variable group,

R_{11} is the reliability coefficient of the more variable group,
and r_{11} is the reliability coefficient of the less variable group.
By the use of formula (1) we may estimate what could be the reliability estimate for the S.F. sample, if it had the same standard deviation as the P.U. sample. Conversely, we could estimate what would be the reliability estimate for the P.U. sample, if it had the same standard deviation as the S.F. sample.

Comparison of reliability coefficients. As already stated, it is the total reliability of the essay-type test that indicates the degree of confidence to be reposed in the essay examination marks. Admittedly, we do not have a reliability coefficient for either examination which is strictly analogous to total reliability. Gayen, *et al.*, (1962), have correlated two different papers which do not even claim to be parallel form. The fact that they are so correlated tells something about the marking. It strongly suggests that even though the questions and the contents in the two papers are different, the examiners are actually marking the same thing in both. Harper's study (1963) corroborates it. His study suggests that it is the correctness of English usage that counts in any English paper. The P.U. examintaion reliability also was not estimated by administering two parallel tests. This was estimated by multiplying content and examiner reliability figures. However, the estimates compared here may reasonably be considered an approximation of total reliability. Table 1 gives the results of the comparison. The total reliability for the S.F. examination was found to be .70. This figure for the P.U. examination was .64. On correction for the difference between the ability ranges of the two samples by formula (1) substituting 8.57, 12.03, and .70 as s, S, and R_{11}, respectively in the formula, we get the reliability estimate of the S.F. exami-

TABLE 1

Comparison between Reliability Coefficients

School Final		*Pre-University*		$z_2 - z_1$	*Standard Error of the Difference between the z's*	*Significance of the Difference*
r_1	z_1	r_2	z_2			
.41	.44	.64	.76	.32	.082	.0002

nation, if it had the same standard deviation as the P.U., equal to .41. The result suggests that the probability is less than one out of one thousand that the observed difference in the two reliability coefficients could occur by chance alone.[3] Since this is a remote possibility we may infer that the reliability of the P.U. examination is higher.

B. *Standard error of measurement*

Concept. The standard error of measurement (SEM) is a measure of the extent to which the marks obtained by a student can differ from his 'true marks'. For example, if the SEM of a test is 5 marks, a student whose true marks are actually 40 is quite likely to get (one chance out of three) marks below 45 or above 55. For the laymen and the students, the SEM is what Taylor called the 'pennumbra of error' which is attached to any measurement. This gives a graphic picture of the practical degree of unreliability of any examination.

Procedure for the estimate of the SEM. If we measure a thing a thousand times, we are likely to get a thousand results. In such a case it will be reasonable to assume that the mean of the thousand results will give the best approximation of the 'true measure' of the thing. The standard deviation of these thousand measures is the SEM. For examinations, the SEM gives an estimate of the standard deviation of a student's marks if he was examined several times (assuming that the student does not change until all the examinations are over). In practice we cannot get a thousand measures of a student's achievement. However, we can still get a sufficiently accurate estimate of the SEM by the formula

$$\text{SEM} = \text{S.D.}\ \sqrt{1-r} \quad (2)$$

where SEM is the standard error of measurement.
S.D. is the standard deviation of the marks on the test, and r is the reliability coefficient of the test.

Comparison of the SEM. When we compared the two reliability estimates, we made a correction for the ability ranges of the two groups studied in the two samples for the reasons already explained.

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[3] We tried the other way also, i.e., correcting the reliability estimate of the P.U. examination. The result led to the same inference.

An advantage in the comparison of the SEM is that they can be directly compared because they are practically independent of the ability levels of the groups selected in the samples. Thus to a layman a comparison between the SEMs is more convincing than between the reliability coefficients. Table 2 gives the result of the comparison of the two SEMs. The reliability figures reported in the tables for each examination are the obtained ones (and not the corrected ones).

TABLE 2

Comparison between the Standard Errors of Measurement

School Final			*Pre-University*			*$S.E.M._1$–$S.E.M._2$*	*Standard Error of the Difference*	*Significance of the Difference*
S.D.	*r*	*$S.E.M._1$*	*S.D.*	*r*	*$S.E.M._2$*			
12.03	.70	6.59	8.57	.64	5.14	1.45	.527	.006

Table 2 suggests that the probability is less than six out of one thousand that the observed difference could occur by chance alone. As this is a very remote possibility, we may infer that the SEM for the P.U. examination is smaller.

The comparison of the reliability coefficients and the SEMs suggest that the chance errors are smaller in the P.U. examination. The statistics of course does not tell us the reason for this. However, it seems reasonable to suppose that the major difference between the two examinations is the reforms introduced in the P.U. examination. If so, this is a strong evidence to suggest that the reforms introduced in the P.U. examination have reduced chance errors in marks.

II. *Constant Errors*

Constant errors are those where a test gives constantly higher or lower results than it should. Constant errors are systematic, hence their amount for individual cases may be estimated and necessary corrections in the marks may be made to minimise such errors. This seems the probable reason why the most widely used estimates of test accuracy (reliability, and standard error of measurement) do not take into account constant errors. The methods of correcting constant errors are generally called 'scaling'.

It may be emphasised that constant errors are no less harmful than chance errors. They may vitiate test results even more than chance errors. If constant errors are not corrected, the accuracy of marks as indicated by test reliability or SEM may be misleading, giving a false confidence in marks. The following illustration will make the point clear.

For practical purposes it seems reasonable to suppose that if marks are accurate a student will get the same class on re-examination. If he does not get the same class, the marks are obviously erroneous. To investigate the accuracy of marks from this point of view we studied the marks of examiners who examined the same set of scripts independently. In a study done by Taylor, *et al.* (1966), 100 scripts of English I of B A. Part I were independently examined by 19 examiners. Tables 3 and 4 show the agreements of the selected pairs of examiners in classifying students in the same classes. Table 3 shows

TABLE 3

Agreement between Examiners 1 and 2

		I	II	III	F	T
Exr. 1	I	—	—	—	—	—
	II	—	—	2	—	2
	III	—	—	4	5	9
	F	—	—	1	88	89
	T	—	—	7	93	100

Exr. 2

I = 60% and above
II = 48% to 59%
III = 33% to 47%
F = below 33%

TABLE 4

Agreement between Examiners 1 and 12

		I	II	III	F	T
Exr. 1	I	—	—	—	—	—
	II	—	—	2	—	2
	III	—	2	7	—	9
	F	—	2	25	62	89
	T	—	4	39	62	100

Exr. 12

that examiner 1 passed 11 students while examiner 2 passed only 7. The agreement between the two examiners in classifying students in the same classes is 92 per cent. Table 4 shows that the agreement between the same examiner 1 and another examiner 12 in classifying the students in the same classes is only 69 per cent. None of the students passed by examiner 1 were failed by examiner 12. On the other hand, examiner 12 passed 27 students (giving two a second class) from amongst those who were failed by examiner 1. Thus examiners 1 and 2 agree 23 per cent more closely in classifying students in the same classes than examiner 1 and 12.

Let us submit the data to statistical analysis to find out whether examiners 1 and 2 agree significantly more closely than examiners 1 and 12, or if the observed differences in the agreement could be attributed to sampling errors only. Table 5 gives the details of coparison. The table shows that the probability is less than one out of one thousand that the observed differences could arise by chance alone. We may therefore infer that examiners 1 and 2 in fact do agree more closely in classifying students in the same classes than examiners 1 and 12.

TABLE 5

Comparison between Agreements of Examiner 1 with Examiners 2 and 12 in Classifying Students in the Same Classes

N	*Agreements with 2*	*Agreement with 12*	*Difference*	*Standard Error of the Difference*	*Significance of the Difference*
100	92%	69%	23%	5.36	.0001

TABLE 6

Comparison between the r's of Examiner 1 with Examiners 2 and 12

N	*With Examiners 2*		*With Examiner 12*		*Difference*	*Standard Error of the Difference*	*Significance of the Difference*
	r	*z*	*r*	*z*			
100	.85	1.26	.93	1.66	.40	.144	.006

Let us now compare the examiner reliabilities for the two sets of examiners. Table 6 gives the results of comparison. The table shows that there are less than six chances out of one thousand that the observed differences in the correlations could occur by chance. We may therefore infer that examiners 1 and 12 do correlate higher than examiners 1 and 2. Comparing Tables 5 and 6 with each other we find that examiner 1 has a higher percentage of agreement with examiner 2, but a higher correlation with examiner 12. This clearly illustrates the fallacy of assuming that a higher examiner reliability for *unscaled marks* means that marks themselves are reliable.

The scaling employed by the Gauhati University corrects constant errors to some extent. No doubt, the method is very crude, yet if this is applied to the present data the agreement between examiners 1 and 12 shoots up from 69 per cent to 93 per cent (which approximately is the correct figure of agreement expected from a test having a reliability coefficient equal to .93). This shows that a considerable amount of error is eliminated by the present method of scaling.

DISCUSSION

The most wanted quality of an examination is validity. But the determination of test validities is the most difficult task in testing. There seldom exists a criterion agreed upon by all against which a test may be validated. Thus, if the paper-setter is satisfied that the question paper measures the desired abilities and the weightages given to each ability is according to the syllabus, the test may be taken as valid provided it is accurate in awarding marks.

Thus, examination reform movement seems to be generally directed towards improving accuracy of marks. Various methods to improve mark accuracy have been suggested. Some of them have been put to use also. But unless there are some follow-up studies to throw light on the actual improvement in mark accuracy due to the incorporation of the suggestions, the validity of the suggestions remains dubious. Such a study is difficult due to different reasons: For any public examination we cannot have control and experimental groups. When such groups are not available we may still have some idea of the improvement in mark accuracy by comparing the reliabilities of two examinations. Even this does not seem feasible in our country because most of the examination bodies do not report their test reliabilities and standard errors of measurement.

Another obstacle is that the test reliability coefficients have frequently been wrongly interpreted. There seems to be an impression that if examiner reliability of a test is high the marks awarded on the test are accurate. As already discussed such a notion is completely wrong for *unscaled marks*. If teachers and students discover that marks are less accurate when awarded by examiners called by the test experts to be highly reliable than the marks of the supposedly less reliable examiners, they are likely to lose confidence in all that test experts talk about. It may be noted that reliability coefficient is a correlational concept. It needs to be interpreted and explained with much caution. The following remarks of Harper (1965) illustrate the point:

> Finally I hardly need to say that correlation coefficients are quite meaningless to the teachers and students with whom we work. And when we try glibly, and sometimes condescendingly, to explain them in half an easy lesson—quite forgetting how long a struggle it took *us* to get a glimmer of their significance—we are likely only to arouse hostility, resentment, and the unspoken conviction that psychology, being so esoteric, must therefore be quite unrealistic and impractical.

The only practical way for reporting the accuracy of marks for the present seems to be to provide a contingency table. This reflects not only the r's but also the means and the S.D.s. Such tables convey more to non-statisticians than reliability coefficients do, and are easily understood by all. For those who believe in sophistication, we should report some similarity coefficients which should take into account means, standard deviations, and r as advocated by Buros (1963).

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Achievement Motive in Tribal and Non-Tribal Assamese Secondary School Adolescents

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The authors report the results of an area research survey undertaken to study the relationship between achievement motivation and some variables relating to the racial, socio-cultural, educational and economic background of the Kachari, Miri and Mech tribes of the Assam region.

The tribals included in this study belong to the Kachari, Miri and Mech tribes who are members of the early Mongoloid race that migrated to the Assam region via the hills of north-eastern India. These Mongolians, in general, belong to the Tibeto-Burman family of the Indo-Chinese group (Barua, 1956, p. 59). Over the years education and improved means of communication have brought the tribals closer to the non-tribal sections of the population. The non-tribal people included in the study are mostly non-Mongoloids or Yans (Barua, 1956). They are mostly Hindus. They form the educationally and socially advanced sections of the region and have kept up with the times like such people elsewhere in the country.

The present paper reports the results of an area research survey regarding the relationship between achievement motivation and some variables relating to the racial, socio-cultural, educational and economic background. The study thus seeks to throw light on *n* Ach and social stratification reported earlier (Mehta, 1967).

SAMPLE

The sample was drawn from 14 secondary schools located in and around Dibrugarh. The schools selected had only one section in their final classes. At the time of data collection all the pupils included in the sample were planning to take the Secondary School Leaving Certificate Examination of the Assam Secondary Education Board. No selection was made from among the pupils. All present on the day of testing were included. In all 383 pupils were available for the final study, of which 294 were boys and 89 were girls.

TOOLS

n Achievement

The TAT test prepared by Mehta (1969) was used for the assessment of achievement motivation. It is a set of six pictures given to respondents following the standard procedure described by McClelland *et al.*, (1953) for TAT test administration. In this method the subject writes stories in response to the pictures shown. These stories were scored for achievement imagery using the scoring system C developed by McClelland *et al.* (1953).

Socio-Economic Status

The variables included under SES are education, occupation and income of the fathers of the pupils. The SES grouping of subjects was made using the socio-economic status scale (urban) Form A (Kuppuswamy, 1962). The five classes suggested in the scale were reduced to three namely, High, Middle and Low classes by combining some of the classes in the original manual. A comparison was made of the tribal and non-tribal pupils in respect of their *n* Achievement. The results appear in Table 1.

The mean score was in favour of the tribal pupils but the difference of the means was statistically significant only at .10 level. The

TABLE 1

Mean n Achievement of Tribal and Non-Tribal Pupils

Groups	*N*	*Mean n Ach.*	*t*	*p*
Tribal	68	5.55	1.646	.10
Non-Tribal	315	4.49		

tribal pupils thus showed a trend for greater achievement motivation than the non-tribals. The results obtained in NCERT (1970) study showed a similar trend.

n Achievement by Sex. The mean *n* Achievement scores by sex presented in Table 2 show that girls had a significant higher *n* Achievement than the boys. There was thus a real sex difference in the achievement motivation levels.

TABLE 2

Mean n Achievement by Sex

Sex	*N*	*Mean n Ach.*	*t*	*p*
Boys	294	4.48	1.802	.05
Girls	89	5.80		

The few researches where a direct comparison of *n* Achievement levels in boys and girls was made tended to show different trends. Veroff (1950), and Veroff, Wilcox and Atkinson (1953) found higher *n* Achievement scores in case of girls when the TAT type test was administered under neutral conditions. Sinha (1967) using self-describing essays for assessing *n* Achievement, found male students to have higher mean *n* Achievement scores than females. Choudhary (1970), used the same set of pictures as in the present study and found girls showing considerably higher *n* Achievement scores than boys in Punjab. Desai (1970) who also used the same set of pictures found it in favour of boys in his Gujarati sample of secondary school students.

With a view to check for any overlapping of the community (tribal-non-tribal) and sex variables the sample was regrouped and their *n* Achievement scores were compared as shown in Table 3.

TABLE 3

Mean n Achievement Scores of Tribal and Non-Tribal Groups by Sex

Group	*N*	*Mean n Ach. Scores*	*Mean Difference*	*t*	*p*
Tribal	1. Boys 60	5.95	1 and 2	1.310	n.s.
	2. Girls 8	2.87	1 and 3	2·442	.02
Non-Tribal	3. Boys 234	3.92	3 and 4	3.030	.01
	4. Girls 81	6.12	2 and 4	1.435	n.s.

Within the tribal group, boys showed greater mean *n* Achievement score than the girls, but the difference was not statistically significant. But the non-tribal girls showed significantly greater mean score than the non-tribal boys. The tribal boys obtained significantly greater mean *n* Achievement score than the non-tribal boys. The tribal girls, however, did not show any significant difference with the non-tribal girls.

The respondents, therefore, appeared to fall into two distinct *n* Achievement level groups: tribal boys, tribal girls and the non-tribal girls with greater *n* Achievement level formed the first group. While the non-tribal boys with a significantly lower level of *n* Achievement formed the second group.

n Achievement by Area of Residence. Like other parts of India the rural economy of Assam is dominated by agriculture (leaving aside tea plantation). These areas have, for a long time, remained backward due to general illiteracy, poverty and poor communication facilities. Since Independence, these areas have received considerable attention of the State. Of special interest is the work of the Community Development Blocks, which aim at effecting a general plan of improvement of rural areas with special attention given to modernising the rural economy. It is essentially an experiment in social change in rural areas, which might have a bearing on level of *n* Achievement of rural people. It was, therefore, of interest to study their *n* Ach. in comparison to *n* Ach. of urban respondents. As shown in Table 4 the rural subjects obtained greater mean *n* Achievement score but the difference was significant only at 10 per cent level. This shows that place of residence had no bearing on levels of *n* Ach. of the respondents.

TABLE 4

Mean n Achievement by Area of Residence

Area of Residence	*N*	*n Achievement Scores*		*t*	*p*
		Mean	SD		
Rural	81	5.58		1.524	.10
Urban	302	4.57			

How does the tribal factor interact with the sex and residence factor? The data on *n* Achievement of the rural-urban pupils were recast to include the tribal element. As the tribal sample included only eight girls, the present analysis of results was made with the data on boys only. Table 5 shows these results.

TABLE 5

Mean n Achievement of Tribal and Non-Tribal Boys by Area of Residence

Group		*N*	*n Achievement Scores*		*Mean difference*	*t*	*p*
			Mean	SD			
Rural	1. Tribal	16	5.87	6.96	1 and 2	0.623	n.s.
	2. Non-tribal	41	4.73	5.99	2 and 3	1.059	n.s.
	3. Tribal	44	5.98	4.90	3 and 4	2.563	.02
Urban	4. Non-Tribal	193	3.75	5.47	1 and 4	1.479	.20

The tribal boys in the rural and urban samples exhibited more or less the same level of achievement motivation. The non-tribals in the rural sample showed insignificantly greater *n* Achievement level than their urban counterparts. The tribal and non-tribal boys in the rural sample did not show significant difference in their *n* Achievement levels, but their urban counterparts did show it. The rural tribal boys showed a tendency for greater *n* Achievement than the urban non-tribal boys although the difference was not significant (p. < 20).

The trend in the results thus appeared to show the following: the tribal pupils, particularly the boys, irrespective of the area of their residence possessed a higher level of *n* Achievement than the non-tribals; and the non-tribals with a rural background came close to the tribals in either group. This suggested that the rural background tended to produce greater achievement striving in the high school boys.

Socio-Economic Status Variables and n Achievement. In most of the previous studies (Rosen, 1956, 1961; McClelland, 1961) the upper-middle and upper SES classes are shown to exhibit a distinctly higher *n* Achievement level. There is also evidence (Strodtbeck, 1955) to show that fathers with higher SES background set higher standards of independence and achievement for their sons. In two Indian studies (Mehta, 1969; Chowdhary, 1970), however, *n* Achievement of high school pupils was found to be not related to SES of their fathers. The results reported above suggested the grouping of respondents on the basis of race, sex and area of residence variables. Wherever possible such groupings were reset by SES variables and studied further.

In case of the urban respondents a composite SES score was obtained for each pupil by combining information gathered regarding the education, occupational and income status of their fathers (or guardians). The scoring was done following the method suggested in Kuppuswamy (1962). For the rural respondents SES data were available only relating to the educational and income variables, and therefore, a composite SES score was not recorded in their case.

TABLE 6

Mean n Achievement Scores by SES Classes of Urban Boys and Girls

SES Classes	*N*		*Mean n Achievement Scores*	
	Boys	*Girls*	*Boys*	*Girls*
High	23	17	6.04	6.76
Middle	89	38	4.08	6.44
Low	125	10	3.48	3.50

F=2.022; boys df=2; NS
F=0.702; girls df=2; NS

The results in Table 6 indicated that the mean *n* Achievement of the three SES groups exhibited similar pattern of relationship in the two sex groups: a more or less linear relationship that showed increase in the mean *n* Achievement score when moved from low to high SES classes. However, the analysis of variance did not yield significant F values.

The lack of relationship between SES and *n* Achievement level of the respondents could probably be due to the interference of the tribal variable. It was, therefore, decided to recast the data for SES by separating the tribal group from the non-tribals. The number of tribal girls being small the girls were not included in the analysis. The results in the case of boys appear in Tables 7 and 8.

The sample of urban tribal boys included in the study did not contain a single case with high SES background.

TABLE 7

n Achievement by SES of Urban Tribal and Non-tribal Boys

SES Classes	Urban Tribal Boys n Achievement Scores		Urban Non-Tribal Boys n Achievement Scores	
	N	*Mean*	*N*	*Mean*
High	(i) —	—	(ii) 23	6.04
Middle	(iii) 8	6.50	(iv) 81	3.84
Low	(v) 36	5.86	(vi) 89	2.51

Pairs of groups compared for mean n Ach.	*t*	*p*
ii and vi	2.869	.01
vi and iii	2.145	.05
v and vi*	3.693	.001

*The mean *n* Ach difference of the rest of the pairs of groups were found to be non-significant.

The tribal sample consisted of all the tribal boys studying in the selected schools. The school-going tribals would belong to the better off tribal families. Therefore, the absence of high SES background appeared to these sections of people. The results in Table 7 showed that the *n* Achievement levels of the tribal boys with Middle and Low SES were comparatively higher, and not significantly different from *n* Achievement of non-tribal urban boys with high SES. Moreover the mean *n* Achievement of tribal boys with middle low SES were significantly greater than the mean score of non-tribal urban boys with low SES The boys with middle SES in two groups did not differ significantly in their *n* Achievement levels. Within the group of urban tribal boys those with middle and low SES did not differ in their mean *n* Achievement levels. Within the non-tribal urban group of boys with different SES there were from slightly to very significant differences in the mean *n* Achievement levels. The urban non-tribal boys from the three SES groups showed a more or less linear pattern in their *n* Achievement levels, the greatest mean score being shown by the high SES group. These results thus indicated that the same SES level showed different *n* Achievement levels in the two racial groups. The tribal factor appeared as a more important factor than SES background in high school-going urban tribal boys. But within the urban non-tribal group, boys with high SES showed significantly greater *n* Achievement than boys with middle and low SES.

n Achievement by Educational Status of Father. On the basis of the educational qualification of fathers the respondents were classified into three educational status groups: High, Middle and Low. The High group included children of fathers with professional or semi-professional education or university education of at least the first degree standard; the Middle group pupils had fathers with high school or college education of a below degree standard; and the Low group included school stage and below.

Table 8 shows the mean *n* Achievement scores of all the boys in the sample according to their fathers' educational status.

TABLE 8

Mean n Achievement of Boys by Fathers' Educational Status

Educational Status	*N*	*n Achievement Scores*	
		Mean	*SD*
High	18	5.16	5.64
Middle	82	4.73	10.93
Low	194	3.92	6.05

F=0.367; df=293; NS

The results apparently showed a linear type relationship between educational status of fathers and achievement motivation in their children, but the F-test indicated that the mean differences were not significant. Thus the result noted by McClelland, *et al.*, (1955) that showed significantly greater *n* Achievement of boys associated with higher educational backgrounds of their fathers was not obtained in the present study. It also did not conform with Mehta's (1969) finding of V-shaped relationship between *n* Achievement of high school boys and their fathers' education.

Table 9 shows the relationship between the educational background of fathers and the *n* Achievement levels of their daughters. The mean score was greatest in case of the High group of girls followed by Low and Middle groups in that order. Apparently the relationship approximated a V-shaped pattern. But the main difference was not statistically significant which suggested that girls with different parental educational backgrounds did not actually differ in their *n* Achievement levels.

TABLE 9

Mean n Achievement of Girls by Fathers' Educational Status

Educational Status	*N*	*n Achievement Scores*	
		Mean	*SD*
High	20	7.25	7.83
Middle	40	5.35	7.55
Low	29	5.96	6.49

F=0.451; df=88; NS

In order to check for any overlapping of the area of residence, the data on educational status of fathers and the *n* Achievement level in children were separated into rural and urban sub-groups. These results for boys and girls appear in Tables 10 and 11.

The three educational status groups of boys from the urban areas generally showed a liner pattern of result but there were no significant differences in their mean *n* Achievement levels. In the rural sample there was no boy student with High educational status father. The Middle and Low groups of rural boys did not show any significant difference in their achievement strivings. But the Middle educational

TABLE 10

Mean n Achievement of Boys by Area of Residence and by Fathers' Educational Status

Educational Status	Urban			Rural		
	N	*n Achievement Scores* *Mean*	*SD*	*N*	*n Achievement Scores* *Mean*	*SD*
High	18	5.16	5.12	—	—	—
Middle	68	4.28*	5.66	14	6.92	5.48
Low	151	3.80**	5.66	43	4.35	6 03

*Urban Middle *Vs*. Rural Middle, t=1.539, p ∠ .20
**Urban Low *Vs*. Rural Middle, t=1.987, p ∠ .05

TABLE 11

Mean n Achievement of Girls by Area of Residence and by Fathers' Educational Status

Educational Status	Urban			Rural		
	N	*n Achievement Scores* *Mean*	*SD*	*N*	*n Achievement Scores* *Mean*	*SD*
High	19	7.42	8.26	1	4.00	—
Middle	31	6 00	7.83	9	3.11	4.66
Low	15	5.46	6.23	14	6.50	6.43

status rural boys who obtained the greatest absolute mean *n* Achievement score, showed slightly significant difference over their urban countreparts. They also exhibited significantly greater *n* Achievement level than the Low educational status urban boys.

In the case of girls with different parental educational backgrounds, the urban sample appeared to exhibit a somewhat linear pattern of mean *n* Achievement scores and the rural sample appeared to exhibit a V-shaped pattern. But none of the mean differences yielded statistically significant values.

Any possible overlap due to the tribal influence in the relationship between *n* Achievement in boys and the educational status of their fathers was further examined and the results are shown in Table 12.

TABLE 12

Mean n Achievement of Tribal and Non-Tribal Boys by Fathers' Educational Status

Educational Status	*Tribal*			*Non-Tribal*		
	N	*n Achievement Scores* *Mean*	*SD*	*N*	*n Achievement Scores* *Mean*	*SD*
High	1	4.00	—	17	5.22	7.55
Middle	6	6.50*	7.41	76	4.59	5.20
Low	33	5.90**	6.08	141	3.17	4.18

*Tribal Middle *Vs.* Non-tribal Low, $t=1.834$, $p < .10$
**Tribal Low *Vs.* Non-tribal Low, $t=3.625$, $p < .001$

The tribal sample contained only one boy with a High educational status father. The three educational status groups within either the tribal or the non-tribal group did not show any significant differences in their mean *n* Achievement. Comparisons made across the tribal and non-tribal groups showed that both the Middle and Low educational status tribal boys had greater mean *n* Achievement than the Low educational status non-tribal boys. This also meant that the tribal boys of fathers with Low educational level did not differ from those of with High and Middle educational levels of non-tribal boys.

n Achievement and Fathers' Income. On the basis of data collected relating to monthly income of fathers of the respondents, four income groups were formed as follows:

Group I: monthly income of Rs. 750 and above
Group II: monthly income between Rs. 300 and Rs. 749
Group III: monthly income between Rs. 101 and Rs. 299
Group IV: monthly income of Rs. 100 and below.

Table 13 shows the mean *n* Achievement and SD values for all the boys in the total sample classified according to their fathers' monthly income.

The data were thus tabulated by sex and four income groups (fathers') in Table 13. The non-significant values of F obtained in case of boys and girls both indicate that the respondents in the four income groups did not differ in their levels of *n* Achievement.

TABLE 15

Mean n Achievement Scores of Rural and Urban Girls by Fathers' Income

Income Group	Urban			Rural		
	N	n Achievement Scores Mean	n Achievement Scores SD	N	n Achievement Scores Mean	n Achievement Scores SD
Group I	7	4.71	6.87	—	—	—
Group II	30	7.73	6.53	8	5.50	5.20
Group III	22	4.54	8.06	3	1.66	3.40
Group IV	6	5.00	6.63	13	5.61	6.42

TABLE 16

Mean n Achievement Scores of Tribal and Non-Tribal Boys Classified by Fathers' Income Groups

Income Group	Tribal		Non-Tribal	
	N	Mean n Achievement scores	N	Mean n Achievement scores
I (a)	—	—	10	7.90
II (a)	7	7.71	60	3.96
III (a)	28	6.71	103	3.15
IV (a)	25	4.64	61	3.78

Pairs of groups compared for mean n Ach.	*t**	*p*
I (b) and III (b)	2.500	.02
I (b) and IV (b)	2.314	.02

*The remaining pairs of groups did not differ significantly in their mean *n* Achievement.

ences among different groups of boys from the tribal and the non-tribal sections are shown.

The three income groups within the tribal section of boys did not show any significant difference in their mean *n* Achievement levels. But within the non-tribal section, boys from Income Group I showed significantly greater mean *n* Achievement than each one of the other income groups. However, these three lower income groups of non-tribal boys did not differ from one another in their levels of achievement motivation. Fathers' income appeared related in some way to *n* Achievement of sons in non-tribal sections, but it was not so in tribal section. None of the three income groups of tribal boys differed significantly from the Income Group I of non-tribal boys. But Group II tribal boys showed significantly greater mean *n* Achievement score than the non-tribal Income Groups III and IV. Similarly Group III tribal boys showed significantly greater *n* Achievement level than the three non-tribal Income Groups II, III, and IV. This suggested that the tribal boys from each of the income groups showed considerably greater *n* Achievement, and in many cases, their achievement motivation level far exceeded that of non-tribal boys from the upper-middle, lower-middle- and the lower income groups.

n Achievement and Fathers' Occupational Status. The boys of fathers belonging to professional occupations showed the highest *n* Achievement, followed by those from semi-professional occupations with those from skilled, semi-skilled and unemployed group showing the lowest. However, as seen in Table 17 there was no relationship between fathers' occupational status and boys' *n* Achievement.

TABLE 17

Mean n Achievement by Fathers' Occupational Status for Boys and Girls

Occupational Group	*N*		*Mean n Achievement Scores*	
	Boys	*Girls*	*Boys*	*Girls*
1. Professional	7	5	7.28	8.00
2. Semi-Professional	16	11	5.06	7.54
3. Clerical, shop and farm owners	80	33	4.10	6.45
4. Skilled worker	40	7	4.12	4.14
Semi-skilled and unskilled worker, and unemployed	94	9	3.17	3.33

F=0.991; df=234; NS
boys
F=0.612; df=64; NS
girls

The *n* Achievement score pattern for girls by their fathers' occupational status is shown in Table. 17. The trend in the distribution of the mean scores was more or less similar to the trend noticed in the case of boys.

The results tended to show that the urban secondary school adolescents did not differ in their level of achievement motivation, by their fathers' occupational status. This result differed from the findings of other researchers. Tamhankar (1967) reported greater mean *n* Achievement in urban school boys from medium business class group, as compared to others in the study. It was similar to the one reported by Fraser (1961) with rural Orissa boys. Medium and big business entrepreneurs in Assam are mostly non-Assamese speaking people whose children mostly attend schools with non-Assamese media of instruction. Children of these groups however were not included in the present study. The results were therefore not directly comparable.

TABLE 18

Mean n Achievement Scores of Tribal and Non-Tribal Urban Boys Classified According to Fathers' Occupational Groups

Occupational Group	*Tribal*			*Non-Tribal*		
	n Achievement Scores			*n Achievement Scores*		
	N	*Mean*	*SD*	*N*	*Mean*	*SD*
1. Professional	—	—	—	7	7.28	8.82
2. Semi-professional	2	13.00	—	14	3.92	4.69
3. Clerical, shop and farm owners	6	6.83	6.28	74	3.87	5.50
4. Skilled worker	7	5.57	4.40	33	3.60	5.31
5. Semi-skilled and unskilled worker and the unemployed	29	5.15	5.93	65	2.58	3.94

Mean difference in n Ach. of pairs of groups	*t*	*p*
1. Between non-tribal professional and semi-skilled and unskilled worker and the unemployed	2.596	.02
2. Between tribal clerical, shop and farm owners and non-tribal unskilled and semi-skilled worker and the unemployed	2.374	.05
3. *Between tribal and non-tribal semi-skilled and unskilled worker and the unemployed	2.539	.02

*Differences in mean *n* Ach. of the rest of the pairs were found to be non-significant.

The urban group of boys included here contained both tribals and non-tribals. Since tribal element was considered a probable dependent variable of *n* Achievement, it was decided to separate tribal and non-tribal boys and to study the relationship between occupational background and *n* Achievement in each case separately. These results appear in Table 18.

The urban tribal sample contained no boy with father doing professional work; it contained only two cases with a semi-professional background. Most of them belonged to skilled or unskilled workers' families. They did not show difference in their levels of *n* Achievement as seen in Table 18.

Within the non-tribals, the professional group of boys showed significantly greater *n* Achievement than boys of the semi-skilled/unskilled workers. The tribals compared with the non-tribal showed greater *n* Achievement in each occupational group, as seen in Table 18.

DISCUSSION

The results indicated that the tribal pupils obtained significantly higher *n* Achievement scores than the non-tribal pupils. This gets support from NCERT's (1969) study in which Munda and Oroan tribal high school boys were found to show higher mean *n* Achievement than non-tribal Delhi high school boys. In order to explain the difference in the mean *n* Achievement levels of tribal and non-tribal children, the lead given by McClelland (1961) to explain similar differences between children of Jews and Protestants might be of some help. His explanation is based on results from several cross-cultural studies (Winterbottom, 1958; Rosen and D' Andrade, 1959; Bradburn, 1963) that indicated a relationship between independence training imparted in early childhood and the development of achievement motivation in children. This calls for examining the way of child growth and development in different racial groups and the prevalence of value patterns among them.

Taking the position that all the tribal pupils included in the present study belong to the same race (Barua, 1956), certain observations may be made about the child-rearing practices prevalent among the tribals and their relevance to the development of greater achievement striving in them. The major constituent of the tribal sample were members of the Mishing or plain Miri tribe who "exhibit a closer approximation to the Pasi Miyongs and the Padams of the Siyang Frontier Division of the North-East Frontier Agency" (Pegu, 1956, p. 3). According to Roy (1966) the tribal boy and girl from the age of crawling "start a new life of independence from parental guardianship and care". He further adds that the tribal toddler "is usually a quiet type of being rather grave, smiles and prattles little, and cries but rarely. It recognises the indifference of the world around to its baby complaints and sufferings and takes the lesson in roughing and self help....The child grows up mostly uncared for in its mother." Underlying this pattern of child development are, acquisition of independence, toughness, and a mastery over the environment by the growing child from a very early age. Elvin (1959) also noted the prevalence of values like self-reliance and discipline, and desire for hard work and cooperation among the tribal people of India in general. As a tribal child grows into adolescence he is attached to a bachelor's dormitory which, among other things, develops among the young a spirit of responsibility, alertness, and habit of taking risk in the face of danger which are essential for the existence of the tribe. Thus all through the developmental period, the growing tribal child is made to face all sorts of vicissitudes that the very process of growth presents. Such training in independence and mastery of the environment received by the tribal child probably helps him to develop an optimistic attitude toward the challenges presented by life.

Achievement motive can be conceptually defined as an 'urge to improve'. If this view is accepted, then a contributory factor for the relatively higher level of achievement motivation in tribal children might be found in the rise of 'tribal sub-nationalism' (Dubey, 1970), expressed in the form of demands for autonomous administrative units for the tribal areas and for tribal unity.

The second contributory factor may be the tribal development programmes carried on by the Central and State governments through the provision of better educational facilities, means of communication, and opening of urban centres in the tribal areas, which has awakened the tribal people to the need of transforming their soico-economic structure.

The foregoing discussion suggests that at least a section of tribals whose children attend schools, are progress-conscious, and that they convey ideas relating to the backwardness and isolation of tribals to their children right from early childhood in such a way that the growing tribal child develops an urge to improve his lot, and probably, that of his tribe.

The results reported here also revealed significant sex differences in the *n* Achievement levels. Any explanation to account for the definite trend in the result of the present study showing superior achievement striving of girls must touch upon the changing socio-cultural, political, economic, and educational conditions in the society. Historically speaking, every where a trend had come to stay for a long period to assign rigidly compartmentalised masculine and feminine roles which, in course of time, received social and political sanction. No wonder it became so much embedded in the culture that a struggle for equality of the sexes had to be unleashed by women everywhere. This amounted to giving women the status of a disadvantaged group which resulted in their remaining in a state of deprivation of social status and position for a long time. The advent of Independence and framing of a new constitution marked the beginning of a new era in the struggle for emancipation of women. Besides this, various women's organisations have all along acted as active agents of women's emancipation in society. These efforts seem to have benefited the growing generation of female children as can be inferred from the significantly greater need for achievement shown by the girls of Assam in the present study. Recently Choudhary (1970) also obtained similar result with Punjab girls. The girls seem to have developed some kind of an internalised value pattern encompassing within it the broad perspective of traditional and changing value patterns as they affect their lives. As a result it seems "some kind of an urge or aspiration for better life has been released and developed in girls" (Mehta, 1970). This probably explains why Indian girls show greater achievement motivation than boys.

This view is further strengthened by studies like Rath and Gokulnathan (1968) who reported that female students in the post-graduate departments of the Gauhati University showed significantly better academic performance than their male counterparts. This suggests that there has come about a change in the growing generation of females in terms of life goals chosen and pursued successfully. In a comparable study with Brazilian girls Angelini (1965) obtained a similar finding. However a number of findings with American girls showed that high need achievers preferred primarily the adult status goals or goals aimed at receiving social acceptability like marriage (Piers, 1961; Strivers, 1957; Lesser, Krawitz, and Packard, 1963). The two goals do not seem opposed to each other. Prabably in the Indian context the intellectual goal is taken as an important one, first for its own sake and then with a view to strive toward more female adult status goals like marriage and a career and/or to try to raise the social status of all women in society through organised movements.

The results showing the relationship of socio-economic status variable to *n* Achievement exhibited somewhat erratic trends. In case of urban school boys and girls a composite SES index and *n* Achievement score were compared. It was seen that children belonging to 'high' SES families possessed greater *n* Achievement than those belonging to middle and low class families though the difference was statistically non-significant. The three SES variables of education, income, and occupation, when compared individually with *n* Achievement of boys and girls showed, by and large, the trends as shown by the composite SES index. Here again the differences were not significant.

Tribals, girls, and rural children who showed significantly greater *n* Achievement than their respective counterparts, came mostly from middle and low SES class families. By and large, their SES background did not show any definte relationship to their *n* Achievement level. But among non-tribals, boys, and urban children those from a higher SES background almost invariably possessed significantly greater *n* Achievement than those belonging to middle or lower class SES group.

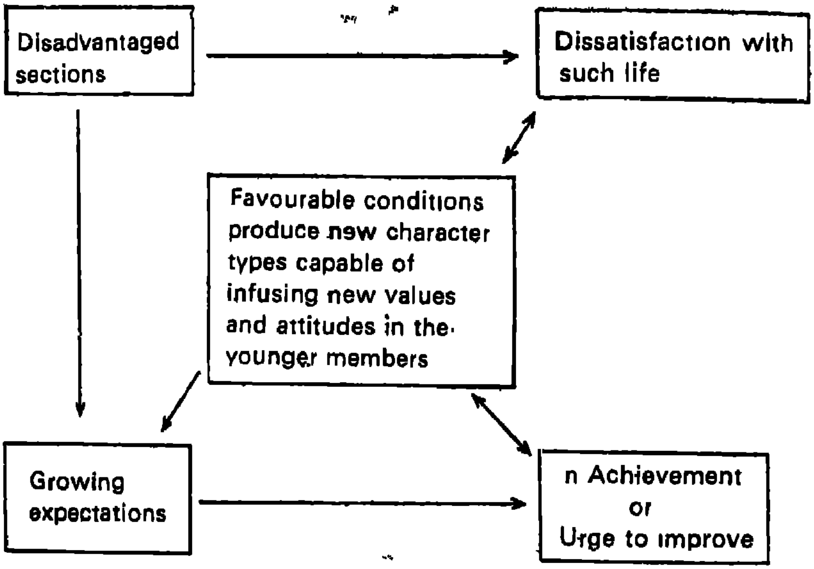
It was clear from the results that SES did not show any regular and definite relationship with *n* Achievement in children. Mehta (1969), and Choudhary (1970) also obtained similar results.

An important finding emerging out of the survey results reported here is the significantly greater *n* Achievement level prevailing in certain sections of secondary school pupils. These sections are tribals, girls and rural residents. Why do these sections show greater urge to achieve? Is there some thing like a common factor that can possibly account for this trend? The discussion in the preceding sections suggests that there is probably some common denominator guiding the destinies of children from these sections. Traditionally conservatism and orthodoxy found their way into the lives of tribals, women, and rural folk in India. In course of time these traits have penetrated deep into the souls of these sections of people leaving them isolated from the socio-culturally progressive sections. The result is that they have remained more outside the main life-current of India than within it. They have come to be known as the 'disadvantageous groups' in new India. The greater *n* Achievement in pupils from these sections may have its roots in their psycho-historeology.

A broader conceptual definition of achievement motivation may be put as "dissatisfaction with the present state of affairs and an urge to improve the life conditions for oneself" (Mehta, 1970). By taking this as a working definition, the greater *n* Achievement shown by children of the disadvantaged groups may be looked upon as an expression of their expanding expectations in life. It may not be true to say that all members of these disadvantaged sections are showing the same greater urge to achieve. But certainly it applies to those children from families where the parents have adopted 'school sending tendency' for their children. The comparatively greater proportion of illiterates in these disadvantaged groups leaves only a small proportion of parents who need to be studied in future research to find a definite answer to account for the greater urge in their children. But an *ad hoc* explanation can be given by making a reference to the socio-cultural history of these groups.

McClelland *et al.*, (1953, p. 63) have also observed that 'the achievement motive develops out of growing expectations'. The diagram on page 88 shows the probable steps of the model suggested here.

The findings reported here have important implications for social change in India. Achievement motivation has been found to be positively related to mobility (Crockett Jr., 1962), role aspirations (Mahone, 1960; Burnstein, 1963), and entrepreneurial activity (McClelland, 1955, 1961; McClelland and Winter, 1969). A significantly greater level of need for achievement in tribals, girls, and rural adolescents probably indicates that the younger generation of these socio-cul-


Disadvantaged sections
Dissatisfaction with such life
Favourable conditions produce new character types capable of infusing new values and attitudes in the younger members
Growing expectations
n Achievement or Urge to improve

turally backward sections are in favour of greater vertical mobility as well as greater entrepreneurial activity. These indications seem to have significance for future socio-economic growth of the country.

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Patterns of Adjustment of Fifth Grade Children from Delhi, Coimbatore and Calcutta

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The authors discuss an investigation undertaken to compare the adjustment patterns of fifth grade children from the cities of Delhi, Calcutta and Coimbatore. The tool used was the Pre-Adolescent Adjustment Scale (Pareek, et al., 1970) and the sample comprised 1427 fifth grade children from Delhi, 558 children from South Delhi, 418 from Calcutta and 486 from Coimbatore. The authors found significant differences between the adjustment patterns of the children from these cities. Although a general trend of moderately high adjustment was found among all subjects, children from Calcutta showed better adjustment than the children from Delhi, followed by the children from Coimbatore.

A review of the adjustment inventories in India and the studies conducted on adjustment shows that very little has been done in studying the adjustment patterns of pre-adolescents. The several adjust-

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ment inventories available in India include Nataraj's adaptation of the Bell's adjustment inventory (1968), another adapted version of the Bell's adjustment inventory by the Bureau of Vocational Guidance in Bihar, Aligarh Adjustment inventory, Asthana's Adjustment inventory (1968), Sinha anl Singh's Adjustment inventory (1968), Adjustment inventory by Mittal (1965), Adolescent Adjustment inventory by Reddy, and so on. These and many other inventories available in India were meant for adolescents and adults. Realising the need for developing instruments to study the personality patterns Pareek *et al.* (1970) have developed a battery of Pre-Adolescent Personality Tests of which the Pre-Adolescent Adjustment Scale (PAAS) forms a major part. Development of this test has been reported in an earlier paper by Pareek *et al.* (1970) in this journal. The current investigation is aimed to study and compare the adjustment patterns of the pre-adolescents from Delhi, Calcutta and Coimbatore.

The Scale

The Pre-Adolescent Adjustment Scale was developed using Thurstone's method of equal appearing intervals. The final form, the items of which are reproduced later in this paper, consists of 40 items chosen from a pool of 180 items based on the judgements given by 190 judges. These items have different scale-values and measure the adjustment towards home, school, peers, teacher and general matters. Test-retest reliability coefficients and validity values using the teachers' judgements have been worked out for this scale and reported earlier by Pareek, *et al.* (1970). The scale showed acceptable levels of validity and reliability.

Sample

Fifth grade children drawn from the cities of Delhi, Calcutta and Coimbatore constituted the sample. The Calcutta sample consisted of 418 fifth grade children from seven (some of which include missionary schools) schools of Calcutta, and the Coimbatore sample consisted of 486 fifth grade children from 13 schools of Coimbatore. The schools were selected randomly and from each school all the fifth grade children were taken. For the study in Delhi two samples were studied. The first sample of 1427 fifth grade children were drawn from 50 primary and middle schools of Delhi run by Delhi Municipal Corporation and New Delhi Municipal Committee. This sample was tested in the early months of 1969. The second sample of 558 fifth grade children were drawn from 20 schools of South Delhi and were tested in 1970. The Calcutta and Coimbatore samples were tested in the beginning of 1971.

Administration

The test was administered as a group test and the time taken by students in different classes ranged from 15 to 25 minutes.

Scoring

On this scale the students were required to check the items of the scale that are correct in their case. The scale values of the items checked were added for each area of adjustment separately so that adjustment score on each area of adjustment is available. As the items of maladjustment were scored with negative scale values, the range of adjustment scores differs from area to area. The theoretically possible ranges in the different areas are as follows:

Adjustment towards home :	10	to	+10
Adjustment towards school :	10	to	+ 6
Adjustmet towards peers :	10	to	+ 6
Adjustment towards teacher :	10	to	+ 6
Adjustment in general matters :	6	to	+ 6
Total adjustment scores	46	to	+34

In this scoring negative scores represent maladjustment and positive scores represent positive adjustment depending on their respective magnitudes. Zero scores represent neither adjustment nor maladjustment and could be obtained either by not checking any particular item or checking the positive items and items whose scale values add to zero.

Data Analysis

Adjustment scores on each area of adjustment as well as the total adjustment score were calculated for the subjects. School-wise means and standard deviations were calculated for the students of three cities. Means and standard deviations were also calculated for the total sample of children of each city for comparisons between the samples. Percentages of students from each of these cities responding to each of 40 items were calculated (for Delhi only one sample was taken for this purpose) to provide further insight into the differences in adjustment patterns. '*t*' test was applied to test the significance of differences wherever needed.

Results

Home Adjustment of the Delhi, Calcutta and Coimbatore Children. The school-wise means and standard deviations of the scores on home adjustment for the samples from the three cities are given in Table 1. As mentioned earlier, the theoretical range of the scores on the area of adjustment towards home is from –10 to +10. For convenience, theoretically, it could be assumed that scores above +5 show high adjustment; scores below +5 and above 0 show moderate to small amount of adjustment; scores between 0 and –5 indicate to a small amount to moderate amount of maladjustment; and scores above –5 indicate a high degree of maladjustment.

From Table 1, the following observations could be made. The mean scores of the first sample of Delhi school range from 3.57 to 9.14, with only 10 per cent (5) of the schools getting means below +5 as compared to second sample of Delhi schools which have means varying from 3.97 to 8.35 with only 5 per cent (one school) of the schools having a mean score below 5. The means of the Calcutta sample of schools

TABLE 1*

School-wise Means and Standard Deviations of the Scores on Adjustment Towards Home for the Fifth Grade Children of Delhi, Calcutta and Coimbatore

DELHI SAMPLE							CALCUTTA SAMPLE			COIMBATORE SAMPLE		
*First***				*Second*								
S. No.	*Mean*	*S. No.*	*Mean*	*S. No.*	*Mean*	*SD*	*S. No.*	*Mean*	*SD*	*S. No.*	*Mean*	*SD*
1.	7.41	26.	7.27	1.	8.29	1.38	1.	6.53	2.51	1.	4.81	4.15
2.	4.12	27.	5.85	2.	6.17	2.82	2.	6.13	3.03	2.	3.21	4.15
3.	5.66	28.	5.06	3.	8.35	2.51	3.	4.37	3.66	3.	5.62	2.38
4.	6.96	29.	7.38	4.	3.97	3.07	4.	7.67	2.70	4.	6.00	1.41
5.	8.00	30.	5.18	5.	7.00	3.94	5.	5.91	3.68	5.	6.85	1.72
6.	6.92	31.	3.88	6.	7.73	2.49	6.	6.01	4.74	6.	7.54	3.21
7.	9.14	32.	6.11	7.	8.13	2.14	7.	6.30	3.18	7.	1.91	4.03
8.	7.50	33.	4.77	8.	7.65	2.22				8.	3.92	3.16
9.	6.85	34.	6.82	9.	5.57	3.63				9.	2.78	4.03
10.	5.48	35.	7.67	10.	6.61	3.07				10.	5.03	3.90
11.	7.09	36.	7.08	11.	7.50	3.01				11.	4.59	2.63
12.	7.00	37.	6.83	12.	7.18	2.64				12.	2.51	4.89
13.	7.22	38.	5.29	13.	6.78	3.28				13.	2.57	3.42
14.	5.60	39.	5.64	14.	6.24	3.19						
15.	6.16	40.	5.42	15.	7.21	1.83						
16.	8.00	41.	6.58	16.	7.34	2.81						
17.	6.12	42.	4.52	17.	5.87	3.76						
18.	7.95	43.	6.66	18.	8.04	1.65						
19.	5.26	44.	5.09	19.	6.39	2.89						
20.	5.71	45.	3.57	20.	7.20	2.14						
21.	5.95	46.	7.96									
22.	8.51	47.	6.97									
23.	6.77	48.	7.71									
24.	7.50	49.	5.63									
25.	7.38	50.	6.43									

MEANS AND STANDARD DEVIATIONS (TOTAL)

First Delhi Sample	*Second Delhi Sample*	*Calcutta Sample*	*Coimbatore Sample*
Mean=6.49 S.D.=3.39	Mean=6.97 S.D.=2.96	Mean=6.11 S.D.=3.62	Mean=4.48 S.D.=4.08

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*School-wise number of cases (N) range from 19 to 39 (except in Serial No. 26 which has 11 cases) for the First Delhi Sample, and 20 to 40 (except in Serial No. 17 which has 15 cases) for the Second Delhi Sample, from 27 to 102 in Calcutta sample and 21 to 72 in Coimbatore Sample.

**Standard deviations for this sample have not been reported here.

vary from 4.37 to 7.69 with about 14 per cent (only one school) having scores below +5. Compared to the Delhi and Calcutta samples, the Coimbatore sample of schools show far inferior adjustment towards home as their mean scores range from 2.51 to 7.54 with about 62 per cent (8 out of 13) of them having scores below +5. These differences indicate the trend that while the home adjustment of the children differ from school to school in the same city, they also differ to some extent from city to city. The differences between the adjustment scores of children from the three cities (and also betwen two samples of the same city) are reflected very well in the mean scores of the total samples. The mean scores of the full samples indicate that second sample of Delhi (or the South Delhi sample of children tested in 1970) was more adjusted towards their home than the first sample drawn from different areas of old Delhi and New Delhi, which in turn showed better adjustment than the Coimbatore sample and the Calcutta sample. Table 2 gives the significance levels of the differences between the mean scores of all the four samples. Except for first Delhi and Calcutta samples, mean differences are significant in all the remaining samples.

TABLE 2

Differences between the Means and the Levels of Significance of the Differences between Delhi, Calcutta and Coimbatore Samples on Adjustment Towards Home

	SAMPLE					
	Delhi II and Delhi I*	*Delhi I and Calcutta*	*Delhi I and Coimbatore*	*Delhi II and Calcutta*	*Delhi II and Coimbatore*	*Calcutta and Coimbatore*
Difference in Means	.48	.38	2.01	.86	2.49	1.63
Level of Significance	.01 level	Not significant at .05 level	.01 level	.01 level	.01 level	.01 level

*The Sample with high mean in each pair of samples is given first. For example, Delhi Sample II has a mean of 6.97 as compared to 6.49 of Sample I, therefore Delhi II is given first followed by Delhi I. The difference of .48 points is in favour of Delhi Sample II.

Apart from these observations the interesting fact is that all the schools of all the four samples have positive scores and most of them above +5 indicating a very high adjustment of the fifth grade children towards their home. As discussed later, this is not the case with their adjustment towards school, teacher, etc.

To gain further insight into the differences in adjustment between the children from the three cities, item-wise percentages of students checking each item were worked out (Table 3). Critical ratios between the percentages would have established the statistical significance of the differences. However, these have not been worked out in view of the significance of the mean differences between the four samples established in Table 2.

TABLE 3

Percentages of Children from Delhi, Calcutta and Coimbatore Samples Checking Each Item Related to Their Adjustment Towards Home in PAAS

Item no. in the original scale	*Item content*	*Scale value of the item*	*Percentage of students checking the item*†		
			Delhi sample N=1427*	*Calcutta sample N=418*	*Coimbatore sample N=486*
30.	I like my parents very much	+4	92	89	86
14.	I live very happily with my brothers and sisters at my house	+3	90	85	86
13.	My parents take care of my amusements	+2	86	81	81
4.	My parents give me full freedom to play	+1	66	64	69
31.	My parents don't allow me to go out alone	0	73	68	65
3.	My neighbours are not good people	−1	41	26	44
15.	My parents interfere with me in every affair	−2	20	43	49
32.	Nobody at home helps me in my school work	−3	35	14	33
1.	My parents get annoyed with me easily	−4	11	25	36

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*Only the first sample of Delhi is reported here.

†Percentages are approximated in all the tables as decimals are not taken into account.

schools (first sample) range from -2.12 to +5.78, as compared to the range of -1.45 to 3.73 in the second sample, +1.23 to +4.11 in Calcutta sample, +0.86 to +3.19 in Coimbatore sample. All the mean scores of Coimbatore and Calcutta schools are positive whereas 26 per cent of schools from first Delhi sample, and 15 per cent of schools from second Delhi sample have negative means indicating maladjustment in these schools. Only 8 per cent of the schools from first Delhi sample, 10 per cent of the schools from second Delhi sample and 8 per cent of the schools from Coimbatore secured mean scores above 3.00 (indicating very high adjustment) whereas 56 per cent of the schools (4 out of 7) from Calcutta have mean scores above +3.00. This indicates a clear superiority of children from Calcutta in their adjustment towards school as compared to those from Delhi and Coimbatore schools. The same is reflected in the mean scores of the total sample, in which Coimbatore sample stands next to Calcutta sample in adjustment towards school. Though Delhi's second sample showed slightly better adjustment over the first sample of children, the difference is not statistically significant as could be read from Table 5. The table also indicates that the gains in school adjustment of Calcutta children over Coimbatore and Delhi, and that of Coimbatore children over first and second Delhi samples are all statistically significant.

TABLE 5

Differences between the Means and Significance of the Differences between Delhi, Calcutta and Coimbatore Samples on Adjustment towards School

	SAMPLE					
	Delhi II and Delhi I	*Calcutta and Delhi I*	*Coimbatore and Delhi I*	*Calcutta and Delhi II*	*Coimbatore and Delhi II*	*Calcutta and Coimbatore*
Difference in means	0.26	2.00	0.98	1.74	0.72	1.02
Significance level of the difference	not significant	.01 level	.01 level	.01 level	.01 level	·01 level

As in the case of adjustment towards home, percentages of students from each city, checking each of the items on this area were worked out and the same are presented in Table 6. The maladjustment of the Delhi children is highly reflected in item 2 in which 47 per cent of them reported that school is a burden for them as compared to only 8 per cent reporting so from Coimbatore and 17 per cent from Calcutta. Similar trend is reflected in item 28, when 30 per cent of Delhi students expressed their dislike for the rules of the school as compared to 7 per cent from Calcutta and 19 per cent from Coimbatore. However, Delhi children are better off when 79 per cent of them say that they don't feel hesitant to ask questions from teachers as compared to 60 per cent of Coimbatore and 74 per cent of Calcutta children, and when 7 per cent more of them than Calcutta children report that they go to school regularly.

TABLE 6

Percentages of Children from Delhi, Calcutta and Coimbatore Samples Checking Each Item Related to Their Adjustment towards the School

Item No. in the Original Scale	*Item Content*	*Scale Value*	*Percentage of Students Checking the Item*		
			Delhi Sample N=1427	*Calcutta Sample N=418*	*Coimbatore Sample N=486*
22.	I go to school daily	+3	92	85	88
23.	I don't feel hesitant to ask questions from teachers	+2	79	74	60
25.	Everybody in the class pays attention to whatever I say	+1	49	42	43
24.	We have got sufficient freedom in the class	0	48	69	79
10.	I hesitate to speak before others in the class	–1	46	34	58
11.	My friends in the school tease me	–2	33	22	34
28.	The rules of the school seem to be senseless to me	–3	30	7	19
2.	The school is a burden for me	–4	47	17	8

Adjustment towards their Peers. The theoretical range of scores on adjustment towards peers extend from −10 to +6 as in the case of school adjustment. The school-wise means and standard deviations of the scores on this area are given in Table 7. The table reveals that except in one school of Delhi there are no negative mean scores indicating that the children of different schools are fairly well adjusted.

TABLE 7

School-wise Means and Standard Deviations of the Scores on Adjustment towards Peers for the Fifth Grade Children of Delhi, Calcutta and Coimbatore Cities

DELHI SAMPLE							CALCUTTA SAMPLE			COIMBATORE SAMPLE		
First				*Second*								
S. No.	*Mean*	*S. No.*	*Mean*	*S. No.*	*Mean*	*S.D.*	*S. No.*	*Mean*	*S.D.*	*S. No*	*Mean*	*S.D.*
1.	3.26	26.	3.82	1.	3.71	2.58	1.	4.58	2.25	1.	3.69	4.01
2.	0.56	27.	3.00	2.	0.30	4.18	2.	2.03	2.73	2.	2.08	3.65
3.	2.37	28.	2.12	3.	3.68	3.28	3.	1.93	3.30	3.	3.76	2.47
4.	3.00	29.	3.26	4.	0.27	3.65	4.	4.18	2.96	4.	5.70	0.71
5.	1.97	30.	2.03	5.	2.86	3.14	5.	3.74	2.86	5.	3.62	2.02
6.	2.28	31.	1.08	6.	4.23	2.41	6.	5.35	1.18	6.	4.40	2.74
7.	2.69	32.	2.47	7.	4.15	1.85	7.	2.71	3.42	7.	0.83	4.14
8.	3.00	33.	0.66	8.	2.00	2.89				8.	2.88	2.90
9.	2.44	34.	1.89	9.	1.48	3.91				9.	3.11	2.53
10.	1.85	35.	3.30	10.	1.21	3.93				10.	4.45	1.41
11.	2.28	36.	2.12	11.	3.42	3.38				11.	2.93	3.13
12.	2.17	37.	3.00	12.	3.37	2.99				12.	2.41	2.56
13.	2 47	38.	0.54	13.	2.57	3.10				13.	1.48	3.30
14.	2.30	39.	1.00	14.	2.24	3.08						
15.	2.21	40.	2.83	15.	2.38	2.35						
16.	3.89	41.	2.74	16.	2.78	2.85						
17.	1.04	42.	2.72	17.	1.07	3.00						
18.	3.92	43.	2.66	18.	2.26	3.54						
19.	1.65	44.	2.24	19.	2.17	3.33						
20.	1.12	45.	1.57	20.	3.12	2.52						
21.	3.32	46.	2.28									
22.	3.56	47.	3.13									
23.	1.81	48.	2.11									
24.	3.64	49.	1.87									
25.	2.48	50.	2.64									

MEANS AND STANDARD DEVIATIONS (TOTAL)

Delhi Sample I	*Delhi Sample II*	*Calcutta Sample*	*Coimbatore Sample*
Mean = 2.31	Mean = 2.50	Mean = 3.67	Mean = 3.13
S. D. = 3.32	S. D. = 3.34	S. D. = 3.00	S. D. = 3.27

Table 8 shows that 5 of the 6 mean differences are statistically significant at .01 level. Percentages of children from these cities checking each of the items related to adjustment towards peers are given in Table 9. A significant observation from this table is the lack of

TABLE 8

Difference between the Means and Significance of the Differences for the Delhi, Calcutta and Coimbatore Samples on Adjustment towards Peers

	SAMPLE					
	Delhi II and Delhi I	*Calcutta and Delhi I*	*Coimbatore and Delhi I*	*Calcutta and Delhi II*	*Coimbatore and Delhi II*	*Calcutta and Coimbatore*
Difference in Means	0.19	1.36	0.82	1.17	0.63	0.54
Significance level of the Difference	Not significant	.01 level	.01 level	.01 level	.01 level	.01 level

TABLE 9

Percentage of Children from Delhi, Calcutta and Coimbatore Samples Checking Each Item Related to their Adjustment towards their Peers

Item No. in the Original Scale	*Item Content*	*Scale Value*	*Percentage of Students Checking the Item*		
			Delhi Sample N=1427	*Calcutta Sample N=418*	*Coimbatore Sample N=486*
17.	I am very happy in the company of my friends	+3	88	86	93
38.	I trust my friends	+2	76	56	86
36.	Some of my friends are good	+1	89	85	87
20.	Very few friends help me	0	83	39	76
6.	I don't want to make many friends	−1	59	34	40
7.	My friends don't allow me to do my school work	−2	33	18	31
18.	I am not friendly with my class fellows	−3	27	18	17
21.	I don't like my friends at all	−4	21	11	17

trust in their friends expressed by nearly 44 per cent (100-56) of Calcutta children on item 38, as compared to 14 per cent of children from Coimbatore and 24 per cent from Delhi samples. Item 7 shows that more of the Delhi and Coimbatore children being disturbed

TABLE 10

School-wise Means and Standard Deviations of the Scores on Adjustment towards Teacher for the Fifth Grade Children of Delhi, Calcutta and Coimbatore Cities

DELHI SAMPLE							CALCUTTA SAMPLE			COIMBATORE SAMPLE		
First				*Second*								
S. No.	*Mean*	*S. No.*	*Mean*	*S. No.*	*Mean*	*S.D.*	*S. No.*	*Mean*	*S.D.*	*S. No.*	*Mean*	*S.D*
1.	4·37	26.	1.36	1.	3·81	1·89	1.	4.30	1·67	1.	2.59	3·39
2.	1.86	27.	3.25	2.	1·77	2·60	2.	2·85	1·75	2.	1·12	3·58
3.	1.53	28.	1.84	3.	3·68	2·01	3.	3·17	3 13	3.	0·67	2·72
4.	2.52	29.	1.65	4.	-0·39	3·63	4.	4·18	1·18	4.	2·87	0.45
5.	2.24	30.	1.97	5.	3·52	1 76	5.	3·22	2·39	5.	2·52	1.22
6.	2.08	31.	1.04	6.	2·96	1·70	6.	4.19	1·35	6.	3·19	2·00
7.	5.00	32.	1.05	7.	4·30	1·86	7.	2·65	2·93	7.	0·47	3·84
8.	2.29	33.	1.06	8.	1·65	2·50				8.	2·86	2·36
9.	3.26	34.	1.16	9.	1·48	3·02				9.	2·44	2·90
10.	0.59	35.	2.36	10.	3·04	2·50				10.	1·48	2·25
11.	2.53	36.	2.23	11.	3·21	3·25				11.	0·89	2·18
12.	3.28	37.	3.46	12.	3·42	2·75				12.	2·29	2·18
13.	3.75	38.	-0.21	13.	2·00	3·25				13.	0·67	1·79
14.	1.73	39.	1.68	14.	2.42	2 81						
15.	1.00	40.	2.83	15.	3·62	2.85						
16.	3.37	41.	2.74	16.	2·69	2·66						
17.	-0.04	42.	0.20	17.	1.60	2·70						
18.	3.24	43.	1.62	18.	3·04	2·17						
19.	1·70	44.	1.67	19.	2·28	2.85						
20.	2.00	45.	3.14	20.	2.80	2.58						
21.	1.59	46.	3.00									
22.	3.49	47.	3.07									
23.	1·90	48.	3·20									
24.	2·46	49.	1·53									
25.	4·21	50.	1·86									

MEANS AND STANDARD DEVIATIONS (TOTAL)

Delhi Sample I	*Delhi Sample II*	*Calcutta Sample*	*Coimbatore Sample*
Mean=2.25	Mean=2.70	Mean=3.55	Mean=2.00
S.D.=3.86	S.D.=2.85	S.D.=2.33	S.D.=2.84

by their friends (whom they are friendly with and trust) as they don't allow them to do their school work. (Could it be that these children enjoy being disturbed and therefore trust their friends? Or could it be that they trust their peers in spite of their interruptions?). However, 59 per cent of the Delhi children say that they don't want to make many friends as compared to 40 per cent and 34 per cent respectively of Coimbatore and Calcutta children who report so (It's quite likely that Delhi children wish to have only a few friends whom they trust). About 21 per cent of Delhi children expressed their strong dislike towards their friends in item 21 as compared to the 11 per cent and 17 per cent of children from Calcutta and Coimbatore respectively. In the remaining items the percentages do not vary as much.

Adjustment towards their Teachers. Table 10 presents the schoolwise means and standard deviations of the scores on adjustment towards teacher for the four samples. Theoretical range of scores is same as in the case of school adjustment and adjustment towards peers. Table 10 indicates that the mean scores in two schools (4 per cent) of the first sample of Delhi and in one school (5 per cent) of the second Delhi sample are negative indicating maladjustment towards the teacher in these schools. In 14 schools (28 per cent) of first Delhi sample the mean scores are at 3.00 or above indicating high adjustment towards teacher in these schools as compared to 9 schools (45 per cent) from second sample whereas in Calcutta about 70 per cent of the schools have means of this magnitude and only one school in Coimbatore (8 per cent) has such a high mean. This indicates that Coimbatore children are not as well adjusted as the Delhi children

TABLE 11

Difference between the Means and Significance of the Differences for the Delhi, Calcutta and Coimbatore Samples on Adjustment towards Teacher

	SAMPLES					
	Delhi II and Delhi I	*Calcutta and Delhi I*	*Delhi I and Coimbatore*	*Calcutta and Delhi II*	*Delhi II and Coimbatore*	*Calcutta and Coimbatore*
Difference in Means	0.45	1.30	0.25	0.85	0.70	1.55
Significance level of the Difference	.01	.01	Not significant	.01 level	.01 level	.01 level

towards their teachers who are in turn compartively less adjusted than the Calcutta children. The same is reflected in the means of the total samples of these areas. Calcutta sample has a very high mean than all the rest while the Delhi sample have higher means than Coimbatore sample of children. Except the difference in means between the first Delhi sample and Coimbatore sample, all the rest of the mean differences are statistically significant as represented in Table 11.

Calcutta students showed the best adjustment towards their teachers and differed significantly from other samples. This is reflected in Table 12 where very few (5 per cent) of them say that they will be happy if their teacher is transferred as compared to Coimbatore (13 per cent) and Delhi (17 per cent) samples. The table reveals that Calcutta students are much more happy with their teacher than the Coimbatore and Delhi children. This superiority of the Calcutta sample may be because of the fact that most of the sample consisted of missionary schools who usually employ good teachers.

TABLE 12

Percentage of Children from Delhi, Calcutta and Coimbatore Samples Checking Each Item related to their Adjustment towards their Teachers

Item No. in the Original Scale	*Item Content*	*Scale Value*	*Percentage of Students Checking the Item*		
			Delhi Samples N=1427	*Calcutta Sample N=418*	*Coimbatore Sample N=486*
5.	My teacher encourages me very much	+3	84	86	84
12.	My teacher listens to me	+2	84	76	84
8.	I don't get frightened in the presence of my teacher	+1	65	58	50
9.	The teacher takes lot of work from us in the school	0	39	15	47
39.	I remember everything at home but forget in the presence of my teacher	−1	39	11	47
40.	My teacher is very strict	−2	53	29	60
26.	My teacher does not mak me understand anything properly	−3	22	8	17
27.	I shall be happy if my teacher is transferred	−4	17	5	13

Adjustment in General Matters. Table 13 gives the means of the general adjustment scores of different samples. The theoretical range of the scores in this area extend from -6 to +6. The table indicates a high level of adjustment in all the samples. For 31 schools (62 per cent) of Delhi sample, for all the schools of Calcutta and for 7

TABLE 13

School-wise Means and Standard Deviations of the Scores on General Adjustment for the Fifth Grade Children of Delhi, Calcutta and Coimbatore Cities

DELHI SAMPLE							CALCUTTA SAMPLE			COIMBATORE SAMPLE		
First				*Second*								
S. No.	*Mean*	*S. No.*	*Mean*	*S. No.*	*Mean*	*S.D.*	*S. No.*	*Mean*	*S.D.*	*S. No.*	*Mean*	*S.D.*
1.	5.37	26.	4.18	1.	4.62	1.43	1.	4.78	2.01	1.	2.83	2.86
2.	1.53	27.	4.20	2.	2.20	1.86	2.	4.03	2.40	2.	2.62	2.77
3.	2.63	28.	2.44	3.	4.71	1.73	3.	3.76	1.98	3.	1.71	1.78
4.	4.48	29.	3.26	4.	2.88	2.57	4.	4.63	1.82	4.	4.74	1.51
5.	2.91	30.	3.38	5.	4.48	1.79	5.	3.21	2.84	5.	4.00	1.28
6.	3.97	31.	3.17	6.	4.73	1.51	6.	5.12	1.38	6.	3.68	1.90
7.	5.08	32.	2.63	7.	5.33	1.24	7.	3.33	2.39	7.	1.81	2.66
8.	3.75	33.	2.49	8.	3.50	1.99				8.	3.84	1.91
9.	4.35	34.	3.79	9.	2.95	2.77				9.	3.89	1.98
10.	2.11	35.	3.67	10.	3.46	2.19				10.	2.88	2.18
11.	3.12	36.	2.96	11.	4.58	2.06				11.	3.37	2.67
12.	3.38	37.	3.58	12.	3.63	2.09				12.	3.46	2.24
13.	4.39	38.	2.43	13.	4.09	1.61				13.	2.10	3.17
14.	2.90	39.	2.44	14.	4.06	2.09						
15.	3.16	40.	2.66	15.	4.79	1.68						
16.	3.89	41.	3.26	16.	3.75	1.91						
17.	2.04	42.	1.16	17.	4.20	2.23						
18.	4.03	43.	3.31	18.	3.78	1.91						
19.	2.17	44.	1.85	19.	3.67	2.01						
20.	2.46	45.	2.86	20.	3.80	1.96						
21.	3.45	46.	2.92									
22.	3.92	47.	5.50									
23.	3.71	48.	3.69									
24.	3.89	49.	3.90									
25.	3.48	50.	3.82									

MEANS AND STANDARD DEVIATION (TOTAL)

Delhi Sample I	*Delhi Sample II*	*Calcutta Sample*	*Coimbatore Sample*
Mean = 3.34	Mean = 3.98	Mean = 4.12	Mean = 3.18
S.D. = 4.15	S.D. = 2.09	S.D. = 2.27	S.D. = 2.43

schools (54 per cent) of the Coimbatore sample the mean scores exceed +3, indicating an average level of high general adjustment in most of the schools of the three cities. In the rest of the schools also, except in a few cases, the means are above +2. The means for the total sample are also indicative of this trend of high general adjustment in these fifth grade children. Children from Calcutta seem to be better adjusted in this area as compared to the Delhi and Coimbatore children among which, again, the Delhi children seem to be better. However, the differences are very nominal (not exceeding 1) and in two pairs they are not significant even at .05 level as shown in Table 14.

TABLE 14

Difference between the Means and Significance of the Differences for the Delhi, Calcutta and Coimbatore Samples on General Adjustment

	SAMPLES					
	Delhi II and Delhi I	*Calcutta and Delhi I*	*Delhi I and Coimbatore*	*Calcutta and Delhi II*	*Delhi II and Coimbatore*	*Calcutta and Coimbatore*
Difference in Means	0.64	0.78	0.16	0.14	0.80	0.94
Significance level of Difference	.01 level	.01 level	Not significant	Not significant	.01 level	.01 level

The item-wise percentages are given in Table 15. About 17 per cent more of Coimbatore children and about 27 per cent more of Delhi

TABLE 15

Percentage of Children From Delhi, Calcutta and Coimbatore Samples Checking Each Item Related their General Adjustment

Item No. in the original scale	*Item content*		*Percentage of students checking the item*		
		Scale Value	*Delhi Sample N=1427*	*Calcutta Sample N=418*	*Coimbatore Sample N=486*
33.	I like to study very much	+3	91	87	91
34.	I don't have the habit of quarrelling with others	+2	81	70	73
29.	I don't get angry easily	+1	84	74	70
35.	I don't like frivolous jokes	0	71	68	67
37.	I can't express myself properly	−1	35	22	38
19.	I want more holidays	−2	15	9	15
16.	I feel inferior to others	−3	44	17	34

TABLE 16

School-wise Means and Standard Deviations of the Total Adjustment Scores for the Fifth Grade Children of Delhi, Calcutta and Coimbatore Cities

DELHI SAMPLE							CALCUTTA SAMPLE			COIMBATORE SAMPLE		
First				Second								
S. No.	Mean	S. No.	Mean	S.No	Mean	S.D.	S.No	Mean	S.D.	S.No.	Mean	S.D.
1.	23.11	26.	18.08	1·	23·62	6·74	1·	23.75	7·14	1·	16·28	14.42
2.	8.37	27.	19.80	2·	11·30	12·30	2·	16·26	7·05	2·	10·31	10.86
3.	12.40	28.	10.87	3·	23·26	8.13	3.	15·12	9.88	3·	12·62	7·15
4.	20.07	29.	17.43	4·	5·27	11·93	4.	24·18	6·39	4·	21·48	2·72
5.	16.44	30.	13.82	5·	18·57	10·63	5.	20·05	11·42	5·	19·37	3·67
6.	15.81	31.	9.09	6·	23·38	5·33	6·	24·78	8·76	6·	21·53	7.38
7.	27.69	32.	12.89	7.	24·73	6·46	7.	18.01	10.88	7·	5·96	13·23
8.	16.04	33.	8.07	8·	15·10	5·57				8·	15·54	8.04
9.	19.75	34.	13.61	9·	11·81	11·95				9·	14·63	9 65
10·	9.40	35·	17.82	10·	14·14	10·58				10·	16.76	7·47
11.	15.14	36·	16·08	11·	20·63	12·08				11·	13·96	8·25
12·	18.14	37·	19·25	12·	19·21	9·53				12·	12·85	8.23
13·	21.55	38·	8·01	13.	15·87	11·01				13·	10·00	9·16
14·	13.03	39·	11.24	14·	16·36	10.08						
15·	11.42	40.	14·83	15·	18·82	8·16						
16·	21.57	41·	17.27	16·	18·63	10.12						
17·	7.04	42.	2.72	17·	12·80	10·61						
18·	21.57	43.	15.77	18·	19·11	8·17						
19.	12·13	44.	12.30	19.	16·31	9·43						
20.	23·34	45:	10.57	20·	18.00	6·75						
21.	15.67	46.	17.28									
22·	20.97	47.	20.90									
23.	14.35	48·	17.74									
24.	17.13	49.	14.46									
25.	20.62	50·	15·46									

Delhi Sample I Mean=15.51, S·D·=11·27, Delhi Sample II Mean=17·53, S·D·=10·55 }
Calcutta Sample Mean=20·57, S·D·= 9.92, Coimbatore Sample Mean=14·90, S·D·=10·39 } Means and S·D·'s given here are for the total group

children seem to have inferiority feelings when compared to the Calcutta sample. Similarly the case with expression, where more of Delhi and Coimbatore students express the problem of expression with them as compared to Calcutta children. In the positive items a few more of Calcutta and Coimbatore children as compared to Delhi sample, say that they get angry easily and also that they have the habit of quarrelling.

Comparisons of the children from the three cities on the total adjustment scores. The total adjustment scores were obtained by adding the scores on the five areas of adjustment for each child. The theoretical range for the total adjustment scores extends from -46 to +34 with 0 as neutral point. The midpoint of the positive (adjustment scores) is 17.5 and for the negative scores it is -23.5. The schoolwise means and standard deviations of the total scores are presented in Table 16. Table 16 shows that about 34 per cent of the schools from first Delhi sample have means above 17.5 (the theoretical midpoint of positive adjustment scores) as compared to 55 per cent of the schools from second Delhi sample, 70 per cent from Calcutta sample and only 24 per cent from the Coimbatore sample of schools. These differences are reflected in total sample means where Calcutta children lead in adjustment scores with a high difference followed by South Delhi, first Delhi and Coimbatore samples respectively. Five out of the six differences are statistically significant (Table 17) and the magnitude of the differences seem to be considerably high.

TABLE 17

Difference between the Means and Significance of the Differences for the Delhi, Calcutta and Coimbatore Samples on Total Adjustment Scores on PAAS

	SAMPLE					
	Delhi II and Delhi I	*Calcutta and Delhi I*	*Delhi I and Coimbatore*	*Calcutta and Delhi II*	*Delhi II and Coimbatore*	*Calcutta and Coimbatore*
Difference between Means	2.02	5.06	0.61	3.04	2.63	5.67
Significance level of the Difference	.01 level	.01 level	Not Significant	.01 level	.01 level	.01 level

It can be concluded from Tables 16 and 17 that statistically significant differences do exist between the overall adjustment scores of children from the cities of Delhi, Calcutta and Coimbatore, a significant fact being that mean scores of these pre-adolescents of the three cities are all positive indicating a moderately high level of adjustment in an average child coming from any of these cities. The apparent superiority of the Calcutta children could be attributed to the background of the sample as the sample included missionary schools and public schools.

Variation in adjustment scores of the children from the three cities. The discussion so far centred round the mean adjustment scores of the pre-adolescents from the three cities and the variations in scores have not been discussed although the standard deviations were used in calculating the significance of the differences. A cursory look at the standard deviations of different schools on different areas of adjustment reveals that schools do vary to some extent in the amount of variation their pre-adolescents show on these areas. However, there seems to be more similarities than differencs. The high standard deviations in most of the cases and the high positive mean scores indicate that scatter is high in the lower end of the continuum (maladjustment side) and low in the positive end.

Summary and Implications

The results of this survey on patterns of adjustment of the pre-adolescents from Delhi, Calcutta and Coimbatore cities revealed that adjustment of pre-adolescents differed from city to city and even in the same city from school to school. Home adjustment was found to be comparatively less in Coimbatore students, adjustment towards school was found to be comparatively less in Delhi students and adjustment towards teacher was found to be comparatively more in Calcutta students. The differences were statistically significant in most of the cases. Inter-school differences in these cities seem to be much more than the intracity differences (although this is not statistically tested out, Tables 1, 4, 7, 10, 13 and 16 indicate clearly to this trend).

For the researcher, these results have the implications of identifying and studying the causal variables of these inter-city, intra-city and intra-school differences in the adjustment patterns of pre-adolescents. Some such variables may include parental behaviour at home, their values and beliefs, socialization patterns in different cities, background of the school, teacher behaviour in the classroom, and so on. Teacher behaviour in the classroom seem to be an important variable as it not only determines the adjustment of the child towards the teacher, but also towards the school and a few other general matters. Isolation of such variables and experimental manipulation of these variables in a direction to improve the adjustment patterns of the students are very much needed if some useful contribution has to be made to the area of pre-adolescent education and personality development.

For the teacher, the results indicate certain dimensions of his classroom behaviour which may be worth examining and experimenting with. For example: Why a great number of students say that they feel hesitant to speak before him? Why a few students go to the extent of feeling happy if he is transferred? What is it that makes the rest of the class feel happy about him? Can he improve on those dimensions? Some such self-examination added with experimentation in his daily classroom behaviour to increase the percentage of positive feelings towards him and the school in the students is required. However, what has been studied here is not in any way sufficient to help the teachers, and researchers have to explore further in this area to provide guidelines for such experimentation to the teachers.

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On Estimating the School-Age Population for Compulsory Education in Some ECAFE Countries

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In this paper the authors have attempted to estimate the population in the compulsory (first level) school-going age groups for most of the countries of the ECAFE region by interpolation from the available population projections by age.

Educational planning is an important component of overall planning for the economic, social and cultural development of a country. This kind of planning is inevitable for countries at all stages of development, but seems particularly urgent for less developed and developing countries since they can no longer afford a delay, wastage or setback in their process of socio-economic change.

Most of the governments of the ECAFE countries have plans to make at least primary education both compulsory and free and thus they need estimates of the number of children for the future for proper planning. In this paper, an attempt is made to estimate the population in the compulsory (first level) school-going ages for most of the countries of the ECAFE region by interpolation from the available population projections by age. The method can also be used to derive enrolment ratios when single year of age data is not readily available.

The authors are thankful to Dr. K.V. Ramachandran, for suggesting the problem and for his help and guidance in the preparation of this paper.

TABLE 1

Compulsory Education and Range of Education at the First Level and Preschool Age Limits for Some ECAFE Countries

COUNTRY	PRESCHOOL AGE LIMITS	COMPULSORY EDUCATION		FIRST LEVEL	
		Age limits	*Duration (years)*	*Entrance (age)*	*Duration (years)*
Afghanistan	3-7	7-13	6	7	6
Australia	3-6	6-15	9,10	5	6,7,8
Burma*	3½-5	—	—	5	5
Cambodia	4-6	6-12	6	6	6
Ceylon	3-5	5-14	9	5	5
China (Taiwan)	4-6	6-15	9	6	6
China (Mainland)	3-7	—	—	7	5,6
Hong Kong					
(i) English school	3-5	—	—	5	6
(ii) Chinese school	3,4-6	—	—	6	6
India	3-6	6-14	8	6	5,7-8
Indonesia	5-7	8-14	6	7	6
Iran	4-6	6-12	6	6	6
Japan	3-5	6-15	9	6	6
Republic of Korea	4-6	6-12	6	6	6
North Korea	4-7	7-15	8	7	4
Laos	4-6	6-9	3	6	6
Macao	4-5	6-12	5	6	5
Sarawak	4-6	6-11,12	6	6	6
West Malaysia	4-5	—	—	6	6
Maldive Islands	2½-7	—	—	5	6
Mangolia	3-8	8-16	8	8	8
Nepal **	3-5	6-10	5	6	5
New Zealand	3-5	6-15	9	5	8
Pakistan ***	3-5	—	—	5	5
Philippines	3-7	7-13	6	7	6
Ryukyu Islands	3-6	6-16	9	6	6
Singapore	4-5	—	—	6	6,8
Thailand	4-6	7-14	7	7	7
Republic of Vietnam	4-6	6-14	5	6	5

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* It is hoped to introduce 4 years of compulsory schooling in 1969 and to extend it to 9 years by 1977

** Information is available only for the English school system

*** It is planned to provide 5 years' compulsory education for all within 10 years

SOURCE : *UNESCO Statistical Year Book, 1968,* United Nations, Paris, 1969.

Table 1 gives the information about the age range within which children are accepted for preschool education, the age groups for compulsory primary education and duration of general education at the first level and the minimum age at which children can enter this level, for a large number of countries of the ECAFE region.

For most of the ECAFE countries the population data by single years of age are available only for the respective census year, and the projected population is given mostly in five-year age groups. But for planning purposes population data by single years of age is essential, e.g., in educational planning, if we want to find the share of school-going population by age and sex out of the total population we need to have the population and participation rates by age and sex. Again, age, sex and educational grade distributions are needed for planning for types of schools and number of teachers needed. But in cases where rough and ready estimates are needed regarding the total school-age populations, a set of interpolation formulae will do for practical purposes. In Table 2, the compulsory education age limits for first level of education and the corresponding interpolation formulae for estimating the population in that age group is shown against each country.

However, if single year of age distribution is needed one of the several well known interpolation formulae (like Sprague, Karup-King, etc.) may be used. If in addition to single year of age values at five year calendar intervals, we need single year values at single calendar year intervals as well, we can take recourse to a set of diagonal interpolation formulae given by Ramachandran.[1]

The formulae have been derived by the method of Newton's interpolation Method. The method of derivation of these formulae can be explained by giving two illustrations—one for the Republic of Korea and another for India.

Let P_0, P_1, P_2 and P_3 denote the populations in the age group 0-4, 5-9, 10-14 and 15-19 respectively. Let us assume that the populations upto ages 4, 9, 14 and 19 are denoted by Y_4, Y_9, Y_{14} and Y_{19}, then,

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[1] Ramachandran, K.V. "Population projections and their uses in economic, social and regional planning and policy-making." Demographic Training and Research Centre, Bombay (mimeographed), 1960.

TABLE 2

*Compulsory Education Age Limits and Corresponding Interpolation Formulae for Estimating the Population in these Age Groups for Some ECAFE Countries**

Country	*Compulsory age limits*	*Interpolation formulae*		
Afghanistan	7–13	0.080 P_{5-9}	+1.560 P_{10-14}	−0.240 P_{15-19}
Australia	6–15	0.640 P_{5-9}	+1.320 P_{10-14}	+0.040 P_{15-19}
Cambodia	6–12	0.728 P_{5-9}	+0.784 P_{10-14}	−0.112 P_{15-19}
Ceylon	5–14	P_{5-9}	+ P_{10-14}	
China (Taiwan)	6–15	0.640 P_{5-9}	+1.320 P_{10-14}	+0.40 P_{15-19}
India	6–14	0.672 P_{5-9}	+1.176 P_{10-14}	−0.048 P_{15-19}
Indonesia	8–14	0.224 P_{5-9}	+1.232 P_{10-14}	−0.056 P_{15-19}
Iran	6–12	0.728 P_{5-9}	+0.784 P_{10-14}	−0.112 P_{15-19}
Japan	6–15	0.640 P_{5-9}	+1.320 P_{10-14}	+0.040 P_{15-19}
Republic of Korea	6–12	0.728 P_{5-9}	+0.784 P_{10-14}	−0.112 P_{15-19}
North Korea	7–15	0 384 P_{5-9}	+1.392 P_{10-14}	+0.024 P_{15-19}
Laos	6–9	0.672 P_{5-2}	+0.176 P_{10-14}	−0.048 P_{15-19}
Macao	6–12	0.728 P_{5-9}	+0.784 P_{10-14}	−0112 P_{15-19}
Sarawak	6–12	0.728 P_{5-9}	+0.784 P_{10-14}	−0.112 P_{15-19}
Mangolia	8–16	0.168 P_{5-9}	+1.464 P_{10-14}	+0.168 P_{15-19}
Nepal	6–10	0.720 P_{5-9}	+0.360 P_{10-14}	−0.080 P_{15-19}
New Zealand	6–15	0.640 P_{5-9}	+1.320 P_{10-14}	+0.040 P_{15-19}
Philippines	7–13	0.080 P_{5-9}	+1.560 P_{10-14}	−0.240 P_{15-19}
Ryukyu Islands	6–16	0.616 P_{5-9}	+1 408 P_{10-14}	+0.176 P^{15}_{-19}
Thailand	7–14	0.416 P_{5-9}	+1.248 P_{10-14}	−0.064 P_{15-19}
Republic of Vietnam	6–14	0.672 P_{5-9}	+1.176 P_{10-14}	−0.048 P_{15-19}

*If in any country the age ranges are different from those given in the above table, a suitable interpolation formula to cover the age range can easily be calculated as per the method given in this paper.

$$
\begin{aligned}
Y_4 &= P_0 \\
Y_9 &= P_0 + P_1 \\
Y_{14} &= P_0 + P_1 + P_2 \\
Y_{19} &= P_0 + P_1 + P_2 + P_3
\end{aligned}
$$

The Newton's formula for forward interpolation is given by

$$Y_s = Y_0 + S\ \Delta Y_0 + \left(\frac{S}{2}\right)\Delta^2 Y_0 + \dots\dots\dots + \left(\frac{S}{n}\right)\Delta^n Y_0$$

where Y_s is value of Y at the point S and ΔY_0, $\Delta^2 Y_0 \ldots\ldots \Delta^n Y_0$ denote the first, second................nth order differences.

$S=\frac{X-X_0}{h}$ where h is the interval between the equally spread values of X, one of which is X_0.

Let Y_S be the polynomial of degree 3 in S, so that we need consider only differences of the order 3 as the 4th order differences will vanish.

Thus,

$$Y_s=Y_0+S\ \Delta Y_0+\left(\frac{S}{2}\right)\ \Delta^2 Y_0+\left(\frac{S}{3}\right)\Delta^3 Y_0$$

Now,

X	Y	ΔY	$\Delta^2 Y$	$\Delta^3 Y$
$X_0=4$	$Y_4=P_0$	P_1		
$X_1=9$	$Y_9=P_0+P_1$	P_2	P_2-P_1	
$X_2=14$	$Y_{14}=P_0+P_1+P_2$	P_3	P_3-P_2	$P_3-2P_2+P_1$
$X_3=19$	$Y_{19}=P_0+P_1+P_2+P_3$			

here h=5

For the Republic of Korea, the compulsory school education comprises the age group 6-12.

Therefore,

$$Y_5=\frac{P_0+P_1(5-4)}{5}+\frac{(P_2-P_1)(5-4)(5-9)}{25\times 2}$$
$$+\frac{(P_3-2P_2+P_1)(5-4)(5-9)(5-14)}{125\times 6}$$
$$=P_0+\left(\frac{1}{5}+\frac{2}{25}+\frac{6}{125}\right)P_1+\left(\frac{-2}{25}-\frac{12}{125}\right)P_2+\frac{(6)}{125}P_3$$
$$=P_0+\frac{41}{125}P_1-\frac{22}{125}P_2+\frac{6}{125}P_3$$

similarly, Y_{12} becomes

$$Y_{12}=P_0+\frac{P_1(12-4)}{5}+\frac{(P_2-P_1)(12-4)(12-9)}{25\times 2}$$
$$+\frac{(P_3-2P_2+P_1)(12-4)(12-9)(12-14)}{125\times 6}$$
$$=P_0+\left(\frac{8}{5}-\frac{12}{25}-\frac{8}{125}\right)P_1+\left(\frac{12}{25}+\frac{16}{125}\right)P_2+\left(\frac{-8}{125}\right)P_3$$
$$=P_0+\frac{132}{125}P_1+\frac{76}{125}P_2-\frac{8}{125}P_3$$

Now, $P_{6\text{-}12}=Y_{12}\text{-}Y_5$

$$=\left(\frac{132}{125}-\frac{41}{125}\right)P_1+\left(\frac{76}{125}+\frac{22}{125}\right)P_2-\left(\frac{8}{125}+\frac{6}{125}\right)P_3$$

$$=\frac{91}{125}P_1+\frac{98}{125}P_2-\frac{14}{125}P_3$$

$$=0.729\ P_1+0.784\ P_2-0.112\ P_3$$

$$=0.728\ P_{5\text{-}9}+0.784\ P_{10\text{-}14}-0.112\ P_{15\text{-}19}$$

Now, for India the compulsory school education age limits are 6–14.

So, Y_5 will be the same as we obtained above, and Y_{14} will be $P_0+P_1+P_2$

$$Y_5=P_0+\frac{41}{125}P_1-\frac{22}{125}P_2-\frac{6}{125}P_3$$

and $Y_{14}=P_0+P_1+P_2$

$\therefore\ P_{6\text{-}14}=Y_{14}-Y_5$

$$=\left(1-\frac{41}{125}\right)P_1+\left(1+\frac{22}{125}\right)P_2+\left(\frac{6}{125}\right)P_3$$

$$=\frac{84}{125}P_1+\frac{147}{125}P_2+\frac{6}{125}P_3$$

$$=0.672\ P_1+1.176\ P_2-0.048\ P_3$$

$$=0.672\ P_{5\text{-}9}+1.176\ P_{10\text{-}14}-0.048\ P_{15\text{-}19}$$

In Table 3, the compulsory school-age population for most of the ECAFE countries by sex for the years 1960, 1965, 1970, 1975, and 1980 has been given after applying corresponding interpolation formulae to the population projections prepared by the Demographic Training and Research Centre, Bombay and ECAFE[a] ('medium' variant).

The growth in the compulsory school-age population is not uniform in all the countries for which the projections are made here. For example, Japan shows an actual decline of 20 per cent and Ryukyu Islands show only a marginal increase of 3 per cent in 20 years. On the other hand, Cambodia, Indonesia, Iran, Mangolia and Thailand indicate more than doubling of their compulsory school-age population in the same period. While it is anticipated that Australia, Ceylon, India, Republic of Korea and Nepal will show about 50 per cent increase in their compulsory school-age populations, the Philippines is

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[a] *Population Projections for ECAFE Countries, 1960-80,* Demographic Training and Research Centre, Bombay and ECAFE, Bangkok, 1969.

TABLE 3

The Estimated Compulsory School-age Population by Sex for Some ECAFE Countries (In thousands)

	1960		1965		1970		1975		1980	
	M	F	M	F	M	F	M	F	M	F
Australia	1033	986	1103	1051	1208	1151	1354	1288	1527	1456
Cambodia	535	506	647	619	795	753	971	903	1136	1061
Ceylon	1292	1219	1484	1391	1735	1622	1892	1788	1936	1835
India	48062	45738	55431	53426	63949	61382	71072	67161	78358	73576
Indonesia	7816	7689	9456	9369	11882	11720	13632	13310	16206	15689
Iran	1872	1868	2252	2233	2699	2654	3319	3235	4041	3898
Japan	10557	10135	8899	8526	7982	7624	8070	7706	8480	8074
Republic of Korea	2301	2122	2894	2757	3313	3221	3407	3319	3770	3661
Mongolia	76	73	93	90	119	115	148	144	161	156
Nepal	561	544	635	639	723	721	809	799	911	892
Philippines	2562	2472	3008	2904	3549	3428	4156	4035	4801	4648
Ryukyu Islands	128	124	142	138	133	128	129	124	133	128
Taiwan	1519	1439	1763	1673	1854	1757	1883	1773	1968	1837
Thailand	2874	2753	3545	3441	4238	4060	4881	5692	5900	5641

expected to have slighty less than double the number in the school-age population as compared with 1960 in 1980 and Taiwan is expected to have only a quarter more than the 1960 number in 1980.

The problem of educational planning is further complicated by anticipated fast increases in participation rates, especially in those countries where the child population growth is expected to be large.

In Table 4 the school enrolment ratios for the first level of education for these countries for the years 1960 and 1965 are given. From this table it is observed that the participation is not full in any country. The estimates presented in the table are the upper limits of the numbers in the school-going population for corresponding years. From the trend of enrolment from 1960 to 1965 it can be concluded that in most cases by 1980 enrolment will be much higher as compared to that in 1960. The reversal of the trend in participation in Thailand, for example, has been imputed to schooling facilities not being able to catch up with population growth.[8]

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[8] *From Panitchapadki, Porn Udompong and Vijit Sangtongs*: Population Labour Force Growth in Thailand. Paper presented to Regional Seminar on Interrelation between Population and Manpower Problems, Bangkok, Thailand, 1971.

TABLE 4

School Enrolment Ratios for the First Level of Education for Some ECAFE Countries for the Years 1960 and 1965

Country	*1960*	*1965*
Australia	78	76
Cambodia	44	53
Ceylon	NA	60
India	34	40****
Indonesia	42	45***
Iran	28	33*
Japan	62	57
Republic of Korea	60	63
Mongolia	40**	NA
Nepal	8	15
Philippines	56	65***
Ryukyu Islands	96	60
Taiwan	67	62
Thailand	59	48

*for 1966 **for 1961 ***for 1964 ****for 1963

SOURCE: *UNESCO Statistical Year Book, 1968*, United Nations, Paris, 1969.

We notice a reversal in the case of Australia, Japan, Ryukyu Islands and Taiwan. These reversals have been brought about by uneven growth in the various age segments of the population over time resulting in variations in the first level of education age group and the population aged 5-14 which has been utilized to calculate the enrolment ratios. It would have been better if the enrolment ratios had been calculated by dividing the number of children in the first level of education by the corresponding susceptible population in the age group. But since there could be early entries and late withdrawls from the first level of education and also because the corresponding population in the susceptible ages are not usually readily available, UNESCO has been forced to present the enrolment ratios as for example in Table 2.5 of the *UNESCO Statistical Yearbook, 1968.*

The formulae presented by us in this note may be utilized to arrive at ratios which are more comparable over time and space.

The growth in participation rate may be quite high when the ini-

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tial rate is low as was also noted by UNESCO.[4] Hence the problem to be faced by the low participation countries, which incidentally have a potential for a large growth in child population, is tremendous.

The estimates given in this paper may be taken by the education planners in the respective countries as the possible course of the burden of the educational outlay in the years to come so that they can gear their social and economic development plans accordingly.

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[4] *Projections in the Field of Education—Plans, Methods and Assumptions,* UNESCO, Paris, 1969.

History of Educational Psychology in the U.S.A. during 1880-1940

Amrit Kaur

The author traces the origin and development of educational psychology in the U.S.A. during the period 1880-1940, in three phases: (i) the origin, (ii) educational psychology during 1900-1918, and (iii) educational psychology during 1918-1940.

It is always difficult if not impossible to set a definite date for the beginning of a movement, point of view, or area of study because the thinking or pronouncements of any man are inevitably affected by those who preceded him. Yet, for practical purposes it is sometimes desirable to establish somewhat arbitrarily as a point of reference a date or period when a given subject, point of view, or emphasis began to become clearly delineated and to take form.

Educational psychology, that branch of psychology which is concerned with learning and teaching, although paralleling to some degree the course of events that have taken place in general psychology, has had its own unique history (Blair, 1948). According to Schoeppe (1958) educational psychology can be traced back to Aristotle. But the science of educational psychology stems from the work in Europe of Pestalozzi, Herbart and Froebel, who attempted to 'psychologize' education by revising the methods of presenting subject-matter. Modern experimental psychology, however, really began in the United States about the turn of the present century (Schoeppe, 1958). According to Gates (1942): "As a definitely recognized field of specialization, educational psychology has only a short history. Many persons think of it as beginning with the appointment of Edward L. Thorndike, Charles H. Judd, Lewis M. Terman, and others to definite university posts to cultivate the field. These men began their work in the field shortly after 1900."

I. THE ORIGIN OF EDUCATIONAL PSYCHOLOGY (1880-1900)

The origins of educational psychology lie imbedded in the history of psychology as a whole, and in the types of philosophical thought about learning and human behaviour that preceded experimental investigation (Seagoe, 1960). Educational psychology is a study of the learning-teaching process in its various ramifications. The need for some kind of educational psychology, therefore, seems to have been felt with the opening of the first normal school in the United States (Roback, 1952). The first manual for teachers *Lectures on School-Keeping*, was brought out by S.R. Hall in 1829, and was reproduced by the Dartmouth Press in 1929. A slender book of 136 pages, it contained some professional information of value to teachers, for S.R. Hall had opened the first normal school for teachers in the United States in 1823 in Concord, Vermont (Good, 1947). *The Teacher* (1883) a book twice the size of its predecessor's was practically without a competitor in the field for a full decade and its popularity is evidenced by the fact that in a quarter of a century, it passed through twenty-five editions. The only other textbook to rival it, and soon to outdo it, was David Page's *Theory and Practice of Teaching*, which since 1847, when it was first published, appeared in numerous editions or reissues (Roback, 1952).

Edward Brooks (1831-1912), who was a pedagogue in the more modern sense also caught the new spirit of teaching in his *Mental Science and Modern Culture*, a book of over 500 pages, which he published in 1883. It could serve as a psychological textbook too, for it treated the very subjects usually found in such works, but the applications to teaching were the chief purpose of the book, and when the author assumed the office of superintendent of public schools of Philadelphia, his work became the standard text for normal schools and other training institutions for teachers (Roback, 1952).

The first compendium to be actually labelled *Educational Psychology* was a booklet by Louisa P. Hopkins, which came out in 1886. Although containing less than a hundred pages, the outline, for such it was, introduced the psychological applications to education more explicitly than some of the larger volumes (Roback, 1952).

G. Stanley Hall (1844-1924). According to Boring (1950), "Hall was the pioneer of education psychology". Boring goes on to say, "James and Dewey gave educational psychology its philosophical sanction, but Hall's compelling dynamism was what got it started ". Educational psychology is a development which began with the 1880's and Stanley Hall had a great deal to do with what happened at first (Boring, 1950). Although the influence of G. Stanley Hall has been most directly felt in child psychology, he deserves mention in a discussion of the history of educational psychology (Watson, 1961).

From the 1880's onward as a well known psychologist, as an academic leader in his capacity as President of Clark University, and as a promoter of worthy causes in psychology, Hall exerted an influence which overrode considerably the theoretical weaknesses inherent in his own research (Watson, 1961). In 1881, Hall gave his immensely successful lectures to teachers (Boring, 1950). In 1882 he was offered a lecturership in psychology at Johns Hopkins University. In 1883, Hall published the first of his papers using the questionnaire to investigate the minds of children. This was followed by a series of studies, some carried out by him and his students but more carried out by others (Watson, 1961). In 1884, Hall was made a professer of psychology and pedagogics, psychologic and ethical theories, physiological psychology, history of philosophy and education (Ryan, 1939). In 1891 Hall founded *The Pedagogical Seminary* now called *Journal of Genetic Psychology*. In 1894, he printed the first of a series of questionnaire syllabi to be used in securing information from children. His important work is the two huge volumes called *Adolescence: its Psychology, its Relations to Physiology, Anthropology, Sociology, Sex, Crime, Religion, and Education* (1904) by which he laid under obligation educational psychologists to a great extent. This work coming at the time when psychology was supposed to be about to unlock the door to scientific education, had a tremendous vogue. Several printings, one even as late as 1924, are an implication that there was solid material, much in demand by child psychologists and educators, although the condensed version which first appeared in 1906. under the title *Youth, its Education, Regime, and Hygiene* enjoyed even more issues. The following year Hall brought out *Aspects of Life and Education*, a collection of article, revised, condensed or amplified with up-to-date bibliographies which was edited by Theodate L. Smith. In 1911, two large volumes of *Educational Problems* again pointed the dominant interest of Hall. In 1912 'an epitome of the published educational writings of President G. Stanley Hall' was published by G.E. Partridge under the main title *Genetic Philosophy of Education* (Roback, 1952).

William James (1842-1910). James contributed to educational psychology through his ability as a public speaker and populariser (Watson, 1961). By the publication of his *Briefer Courses in Psychology* and *Talks to Teachers on Psychology* (1897), James became known to teachers of every class. The lectures composing the little volume were only an episode in their author's work, but having them to write, his nature could tolerate no imperfection. And being in some measure an expression of his nature, they have been not only a model of popular science, but a power working everywhere for open-mindedness, sincerity, and modesty in thought about teaching (Thorndike, 1910). According to Watson, despite its mundane title his *Talk to Teachers* is a brilliant book, and is carmmed with still pertinent practical suggestions on educational matters given in his usual vivid style (Watson, 1961).

Thorndike considered James as a person bestowed with an extraordinary sense of fact (Thorndike, 1936). James won a place for himself as an educational psychologist by the publication of his *Principles of Psychology*. This book published in 1890, had a profound effect on the development of psychology as a natural science. In it he saw the mind in terms of its use in survival and in competition and thus carved out the beginnings of the so called functional approach to psychology. The book itself is free of specific reference to educational application. Rather it served as a source for others to draw implications for education. It performed what Morris so aptly called its particular function, that of a watershed initiating the flow of the future (Watson, 1961).

James Mckeen Cattell (1860-1944). The influence of Mckeen

Cattell on educational psychology was more of a general character than was that of some of the other pioneers. He worked assiduously toward promoting all applications of psychology, including educational psychology. He organized journals (along with J. Mark Baldwin) *The Psychological Review, Psychological Monographs* and *Psychological Index;* served as an editor of *Science, American Men of Science, Scientific Monthly,* and *School and Society* and was a founder of Psychological Corporation (Watson, 1961).

It was in the area of mental tests that Cattell made his most direct contribution to educational psychology (Watson, 1961). In 1890 he proposed a programme of mental measurement in the British journal *Mind* (Cattell, 1890). The tests he proposed measure acuity of sensation, rapidity of movement, simple judgment, and memory. By focussing his attention on the field of testing various mental functions in a large scale, he thereby added a new branch, viz., differential psychology. He supported the educational innovation of teaching the youngsters to read whole words first, rather than letters, on the basis that short familiar words require no more time to read than single letters (Roback, 1952).

John Dewey (1859-1952). The sheer diversity of the many contributions of Dewey has to some extent obscured his very real gift to educational psychology. The fact that Dewey performed little or nothing in the way of data research also strengthened the tendency to minimize his furtherance of educational psychology (Watson, 1961).

The new orientation of experimental psychology was ushered in by John Dewey, in 1889, through his (and J.A. McLellan's) *Applied Psychology,* which was at bottom, a textbook setting forth the principles and practices of education. His (and McLellan's) *The Psychology of Numbers* (1895) is again a pedagogical work, a treatise with reference to the teaching of arithmetic. Dewey's later books deal directly with education (Roback, 1952) such as *Moral Principles in Education* (1922), *The Way Out of Educational Confusion* (1931), *Experience and Education* (1938).

Dewey's fullest expression of functional psychology came in his article "The Reflex Arc Concept in Psychology" (1896) (Watson, 1961), in which he says, "What is wanted is that sensory 'stimulus', central connections and motor stimulus responses shall be viewed, not as separate and complete entities in themselves, but as divisions of labour, functioning factors, within the single concrete whole now designated as the reflex arc" (Dewey, 1896).

The first consequences of the new movement of functional psychology were the furthering of animal psychology and educational psychology. In 1900, Dewey made his presidential address before the American Psychological Association on 'Psychology and Social Practice', a plea and a programme for educational psychology. Dewey was made director of the new School of Education at Chicago in 1902. Then in 1904, Teachers College called him away where he remained until his retirement in 1930 (Boring, 1950). Many of Dewey's contributions had been to the area between the philosophy of education and psychology in which he would draw upon both fields. In *How We Think* (1933) he discussed the use of intelligence and an intellect method assimilated to the behaviour of the individual as he solves his problems.

It was through the work of these pioneers that educational psychology was founded.

Other Closely Related Developments

The Beginning of the University Study of Education and Appearance of Graduate Schools. What was apparently the first department of education, the Department of the Science and Art of Teaching, was founded at the University of Michigan in 1879. This was followed by the establishment of a Department of Pedagogy at the University of Washington in 1881 and similar departments at the University of North Carolina and at Johns Hopkins University in 1884. Teachers College of Columbia University was founded in 1888. The University of Chicago was organized in 1900. In 1896-97 the United States Commission of Education reported that 220 out of 432 institutions of higher learning offered courses in pedagogy (Watson, 1961).

Courses in Educational Psychology. The first normal school in the United States, which was founded at Lexington, Massachusetts in 1839, had among its courses one called 'Mental Philosophy' which was in reality a course in psychology. The normal school at Oswego, New York which was established in 1863 had at the very outset a course entitled 'Child Study' (Crabb, 1926). In 1866 the normal department of the University of Iowa offered a course in mental philosophy as did also the normal department of University of Missouri in 1869 (Luckey, 1903). In 1870, a course entitled 'Child Psychology' was required of all students enrolled in the Bridgewater, Massachusetts, normal school (Robinson, 1930). The Department of Pedagogics of the University of Indiana was clearly offering a course in educational psychology in 1886. The normal department of the University of North Carolina was offering a course entitled 'Methods of Culture-Educational Psychology' in 1886 (Luckey, 1903).

In educational circles in the late 1880's the need for courses in educational psychology was beginning to be voiced explicitly by educators (Watson, 1961). In 1888 in San Francisco, the meeting of the National Education Association devoted considerable attention to educational psychology and its role in the training of teachers. At this meeting Baldwin stressed the value of educational psychology for placing the teacher in a position where he can better understand the pupil, and hence, more intelligently lead him (Baldwin, 1888). During 1890's courses entitled 'Educational Psychology' were offered by the pedagogical departments of practically all teacher training institutions. But upto the end of the 19th century the term child psychology was used more often than educational psychology.

Educational Journalism. Educational journalism was born in 1818 when Albert and John V. Pickct of New York brought out *The Academician*, a sixteen page semi-monthly. It ran for only 25 numbers. It presented a psychological theory of education based upon the doctrines of Bacon and Locke. It reviewed for its readers the ideas of Pestalozzi, Fallenberg, and Lancaster, all of whom were then living, and gave the practical advice to teachers and published school news. A few years later, William Russell formulated the *American Journal of Education* and this was continued under the title *American Annals of Education* by William C. Woodbridge. The *Common School Assistant* (1836) edited by J.O. Taylor at Albany was privately supported but was distributed to the public school teachers. In 1839 H. Bernard began to issue the *Connecticut Common School Journal* and Horace Mann the *Common School Journal* for the teachers of Massachusetts which besides spreading educational information published the plans of teaching (Good, 1947).

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Measurement. Before 1900 there were only occasional instances of measurement of growth. These were concerned with increments in size usually height and weight. Perhaps the earliest recorded series of observations is that made by Montbeillard on the height of his own son from birth, in 1760, to 18 years (Scammon, 1927). Observations of the behaviour of children were even more rare and were usually based on diary notes which had been made on one or two infants, as observed by a close relative, and only for the first year or so of life. Notable among these observations are by Moore (1896) and Shinn (1907).

One of the first attempts in the United States to make systematic the physical and mental growth of children, and the intercorrelationships and dependencies of various aspects of growth was by Bird T. Baldwin. J.M. Baldwin's *Mental Development in the Child and the Race* (1894) was one of the most ambitious treatises in child psychology for that period, a pioneer piece of work stimulated by his fatherly interest in his two little girls. There were formal examples, or at least observational data, on right and left handedness, on speech, colour perception, suggestion, imitation, all correlated with findings in folk and social psychology.

Objective measurement in education had its beginning with the publication of two papers on achievement in spelling, written by J.M. Rice (1897) in which he proposed that uniform spelling tests be given to students (Rice, 1897). His proposal attracted much attention and stimulated much discussion mostly hostile. Thus the groundwork was laid for the great surge in scientific research which charaterized the first quarter of the 20th century.

II. EDUCATIONAL PSYCHOLOGY DURING 1900-1918

It was at the turn of this century that educational psychology became distinct from pedagogy and from child study. Thorndike's *Educational Psychology* was published in 1903, and the very next year his *Mental and Social Measurement* was published in which he considered measures of central tendency, variability, and correlation and so made available to the student an understanding of the treatment of data which was beginning to flow in increasing amounts from laboratory and the classroom. The test movement paralleled educational psychology providing the latter with its important tool.

By 1910 educational psychology had become the general psychology of learning, motivation, emotion, heredity and environment, personality and individual differences, some of it derived from the use of tests and the rest of it taken over bodily from experimental psychology (Boring, 1950).

Edward Lee Thorndike (1874-1949). It is, however, in the work of Thorndike that educational psychology first took form as a consistent and relatively well rounded body of knowledge, based on experiment and observation, and having always as its final basis of reference the actual behaviour of a human being undergoing the stimulus of a definite situation (Leary, 1924). R.I. Watson considers Thorndike to be the first man to deserve to be called an educational psychologist in the modern sense of the word (Watson, 1961). According to Tolman, "The psychology of animal learning, not to mention that of child learning, has been and stil is primarily a matter of agreeing or disagreeing with Thorndike, or trying in minor ways to improve upon him. Gestalt psychologists, conditioned-reflex psychologists, sign-gestalt psychologists, all of us here in America seem to have taken Thorndike, overtly or covertly as our starting point" (Hilgard, 1956).

Thorndike spent almost his entire academic life at Teachers College, Columbia University, where for over forty years he laboured on problems of educational psychology. In 1903, came out his *Educational Psychology*, which in his own words, "attempts to apply to a number of educational problems the methods of exact science" (Thorndike, 1903). He goes on to say, "The science of education when it develops will like other sciences rest upon direct observation of experiments on the influence of educational institutions and methods made and reported with qualitative precision."

Thorndike systematized the study of learning. His *Elements of Psychology* (1905) contained his formulation of a variety of 'laws of learning', exercise, effect and readiness. He tested and elaborated concepts about learning in terms of school situations. In his three-volume edition of *Educational Psychology* (1913-14), he says, "both theory and practice need emphatic and frequent reminders that man's learning is fundamentally the action of the laws of readiness, exercise, and effect." Thorndike's system has sometimes been called 'bond psychology' or simply 'connectionism', as such it is the original stimulus-response or S-R psychology of learning (Hilgard, 1956).

From the very beginning of his career down to the present time, Thorndike has been a very influential figure in the field of educational psychology. His *Educational Psychology* was for many years both a pioneer and a standard work in the field. During 1898-1940, he wrote 441 books, monographs, and articles, most of which dealt with some aspect of the psychology of education (Thorndike, 1940).

Charles H. Judd (1873-1946). Sharing with Thorndike the honour of being a pioneer educational psychologist was C.H. Judd. He was a prominent figure in educational psychology. His *Genetic Psychology for Teachers* was published in 1903 which as he himself says was written to acquaint teachers "with the spirit and results of the scientific study of mental development" (Judd, 1902). In this book he tried to show how learning to read or write is a process of social inheritance. Judd summed up his twenty-two years at Chicago as the Administrative Officer in School of Education by saying:

> During the twenty-two years that I have been in Chicago, I have been able to carry on four lines of scientific work in the field of educational psychology. First, I have shared in the analysis of reading to which Department of Education has given much attention. Secondly, I made an effort in 1915 to formulate and discuss the major psychological problems which arise in high-school education. Thirdly, I have done some experimental work dealing with number consciousness. Fourthly, I have taken the first step in the direction of formulating the social psychology on the basis of which I believe all sound education must ultimately rest (Judd, 1932).

It was in the field of reading that his work was particularly outstanding.

Lewis M. Terman. Terman, another early pioneer in the field of modern educational psychology, published his first article in 1904. This was followed by numerous articles dealing with gifted or retarded children, and finally in 1916 appeared his monumental book, *The Measurement of Intelligence* and now famous Stanford-Binet Scale.

Other educational psychologists who contributed to educational psychology during this period were A.I. Gates, S.L. Pressey and Frank N. Freeman.

Other Developments

Measurement. It is interesting to note that whereas many of the roots of the scientific study of education are to be found in Europe, it was the combined effort of educators working in America which gave impetus to the measurement movement in education, and to the scientific study of educational problems, ultimately leading to the establishment of educational research bureaus first in connection with city school systems, then in colleges, universities and state departments of public instruction, and later by professional groups. Psychological testing in the Army in 1917-18 dramatized the possibilities of educational research.

Early in the 20th century there was widespread interest in objective tests and measurements. In 1902, Thorndike, influenced by Boas, Cattell and others, pubished the first book dealing directly with the subject of measurement to make generally accessible the statistical approach to the problems of education, sociology, economics and anthropology. The first state department of education to establish a bureau of tests and measurements was that of Wisconsin in 1916.

Intelligence Testing. Thorndike sorted out three types of intelligence, the abstract, the mechanical and the social. Goddard, Terman and Kuhlman introduced the Binet tests in the United States. In 1916 Terman extended and modified the Binet Scale to be used in the United States. Terman summed up his contribution in this area by saying:

> I am fully aware that my researches have not contributed very greatly to the theory of mental measurement or problems of less theoretical significance; but of importance for the usefulness of tests and for the psychology and pedagogy of individual differences, I think I have made contributions of value (Terman, 1932).

Achievement Testing. The achievement testing movement is commonly dated from the work of Thorndike and his students. Stone, a student of Thorndike, published his Arithmetic Test in 1908, (Stone, 1908) which is considered to be the first standardized achievement test. In 1909 Courtis published his Arithmetic Tests(Courtis, 1909). Thorndike's handwriting scale appeared in 1910. The other tests published before 1916 were Hillegas Composition Scale (1912), Ayre's Handwriting Scale (1912), Buckingham Spelling Scale (1913) and Starch's Reading Tests (1915). From 1917 onwards the development of tests was so rapid that by 1928, just two decades after the appearance of the first standardized test, nearly 1300 standardized tests had been catalogued (Monroe, *et al.*, 1928).

Child Psychology. Child Psychology is frequently grouped with educational psychology, but it should be given a separate place or else combined with genetic or developmental psychology. Here the pioneers are Hall and Baldwin. In the early days of Clark, child psychology flourished under Burnham and Chamberlaine along with pedagogy (Raback, 1952). Many if not most of the experiments which were conducted in the Clark Laboratory were along the lines of child psychology. National Education Association found a section for child study in 1880 (Boring, 1950). Even at the turn of the 20th century the term child psychology was very frequently used for educational psychology. In Baldwin's *Dictionary of Philosophy and Psychology* (1903) Rand found about 400 items to list under child psychology but none to list under educational psychology (Baldwin, 1903).

By 1918 educational psychology had been established as an important field of research and its period of incubation drew to a close.

III. EDUCATIONAL PSYCHOLOGY DURING 1918-1940

The establishment of the American Association for Applied Psychology was the signal for giving educational psychology a slightly different orientation from that which it had commonly had in the past.[1] The term 'educational psychology' according to former Dean James E. Russell of Teachers College was coined when Throndike was given a faculty appointment at Teachers College, and certainly Thorndike's name had been associated continuously with educational psychology since the beginning of the century. However, psychology was applied to educational problems long before Thorndike's day.

When Thorndike came on the scene he contributed to an expiring movement, then known as child study, and his little known volume on *The Human Nature Club* is addressed to that group. This early book contains the germ of his later development and exposition of Instinct, Fatigue and Individual Difference topics which have been the backbone of educational psychology during all the intervening years. Thorndike's educational psychology was added to and modified by two new movements almost simultaneously about 1926. One was precipitated by G. Watson in an article in *Journal of Educational Psychology* (December, 1926) entitled 'What should be Taught in Educational Psychology?' in which he pointed out the neglect of certain important topics; namely those dealing with personality adjustments, emotion, which might provide teachers with a more profound understanding of their pupils as individuals, rather than with how children learn isolated bits of subject-matter. The Gestalt movement coming from Germany penetrated educational psychology in the United States at about the same time in a book by R.M. Ogden *Psychology and Education* (1926) and later by R.H. Wheeler *Principles of Mental Development* published in 1932 (Symonds, 1939).

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[1] Address of the retiring Vice-President of Educational Section of the A.A.A.P. read at Columbus, Ohio, on 5 September 1938.

It was during this time that educational psychologists tried to apply the scientific method to the study of problems they considered important to the educative process; they developed methods to investigate such problems and theories to explain the findings and they modified methods and theories as new findings required it. Thorndike, Terman, Gates, Freeman and others attempted to build a scientific educational psychology, providing education with facts and laws which might serve as a basis of a definite technology.

Other Developments

Intelligence Testing. As a field of study and application educational psychology received considerable stimulation during the 1920's from the development of the intelligence test arising from the work of Binet and those who came after him. Compulsory school attendance, the increase in the length of the school period; and the increasing number of backward students in the schools created a favourable situation for the avid use of Stanford-Binet (Watson, 1961). Stanford-Binet which first appeared in 1916 (Terman, 1916) was revised in 1937 (Terman and Merrill, 1937). The idea of "g" which is often interpreted as 'general' intelligence originated with Spearman in 1927. The same year, Thorndike criticized intelligence tests for their ambiguity in content, the arbitrariness of the units used for the scores, and for the ambiguity of the significance of any score. He attempted to remedy these defects by developing the CAVD test, comprehension, arithmetic, vocabulary, and following directions (Thorndike *et al.*, 1927).

Group Testing. The major early development in group testing was the invention, standardization, and use of Army Alpha and Army Beta during World War I, which were used in selecting army recruits. The group intelligence tests were applied to school problems in 1920's. The Otis Group Intelligence Scale appeared in 1918 and The Terman Group Test of Mental Ability and The Haggerty Intelligence Examination, Delta II, both appeared in 1920. Both CAVD Intelligence tests appeared in 1927. Group testing of intelligence was established as an important phase of educational psychology by the beginning of the thirties (Watson, 1961).

Achievement Testing. It was not until the publication of the Stanford Achievement Tests by Kelley, Ruch and Terman in 1922 that comparable measures of achievement in several school subjects became possible. By 1927 a sufficient number of forms of this battery of tests were available for growth studies in the various elementary school subjects.

Reading Achievement. In order to measure growth over a period of time several comparable forms of a test are needed. This requirement was first met in measuring achievement in reading when Thorndike and McCall published their reading scale in ten forms in 1920. As the results of scientific studies of reading became available, various efforts were made to develop valid reading programmes. The product of such efforts is exemplified in reports on reading in 1925 (NSSE, 1925) and 1936 (NSSE, 1937). One of the most elaborate efforts to organize a reading programme on the basis of scientific studies appeared in 1939. Gray studied the results of scores of investigations relating to growth in attitude and traits, to children's interests in reading and to growth in specific phases of reading (Gray, 1939).

Courses in Educational Psychology. In 1919 Freeman said, "If one asks what the course in educational psychology is, the reply must be that it is as many things as there are institutions giving it" (Freeman, 1919). Deyoe (1934) has summed up the trends in the courses in Psychology and Education which were included in the prescribed

TABLE

Subject	*Number and Per Cent of Institutions by Periods*							
Psychology— general and/or educational	1902 — 1903		1912 — 1913		1922 — 1923		1932 — 1933	
	Elem. 44	Sec. 7	Elem. 43	Sec. 13	Elem. 4	Sec. 23	Elem. 32	Sec. 30
	No. % 42 95	No. % 7 100	No. % 43 100	No. % 12 92	No. % 41 100	No. % 23 100	No. % 3 97	No % 29 97

portions of the curricula for the preparation of elementary school and secondary school teachers in state normal schools and teachers' colleges.

Using 1927-30 as the base years, Gates analysed various studies concerned with the programme of courses in educational psychology in representative teacher training institutions. As Gates indicates, the expansion of courses considered mainly of developing as separate courses some of the topics formerly treated more briefly in the general courses in educational psychology (Watson, 1961).

Textbooks. One of the early studies of the content of educational psychology as revealed by standard textbooks in the field was conducted by Worcester who mentions the five standard textbooks of the 1920's to be by Starch, Gates, Strong, Pyle and Seashore (Worcester, 1927). A study by G. Watson in 1926 showed books by Starch, Gates, and Strong to be most widely used at that time (Watson, 1926). In 1931 the texts used in courses on educational psychology were those written during the 1920's. During 1930's textbooks on educational psychology were those of Pressey, Stroud, Cuff, Skinner, Commins, Judd, Douglas, Trow and Garth.

Child Development. One of the first systematic studies of physical and mental growth in a variety of its manifestations was carried on under B.T. Baldwin, Director of Iowa Child Welfare Station from 1917 to 1928. In 1921, Baldwin published a classic study of the physical growth of children with primary emphasis on anthropometric measures. He worked out the growth curves of these measures including some for individual children, repeatedly measured. The technique of longitudinal study was followed at various other institutes of child welfare which began to function throughout the country during these years (Watson, 1961). The Society for Research in Child Development was organized in 1935 under the initial sponsorship of the National Research Council Committee on Child Development. The Society publishes *Child Development* and Monographs of the Society for Research in Child Development and Child Development Abstracts and Bibliography.

Conclusion. During this period there was an overwhelming emphasis in educational psychology upon the practical application of psychology. Theoretical issues were neglected. The field of educational psychology had become very complex because of the extension of its scope (Watson, 1961). By the end of the period under consideration the number of educational psychologists had greatly increased. It already had become impossible to place a few of them on to a pedestal by themselves.

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Effect of Group Processing on MMPI Scores of a Group of Tribal Adolescents

Sukumar Bose

Group processing in a physical education programme has been claimed to be potent in creating a suitable field for social learning to generate adequate forces for changing the personality modes of regular participants, since through a continuous conditioning they develop a readiness to take on the attitudes of co-participants and learn to recognise the interrelationships of different roles in teamwork. The set of responses are so regulated by rules that the correct attitude of one will draw out the appropriate attitudes of the other due to reflexiveness, and thus the participants learn to adjust in the process and influence others, reciprocally. With the above frame of reference, the study reported here aims at evaluating the efficacy of group processing in changing the attitudes and improving the adjustment status of a group of tribal adolescents in the Darjeeling Hills, as detected by comparing their pre- and post-programme participation MMPI scores.

Changing the forces impinging upon an individual in his field of relationships is a way of bringing about changes in the individual

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(Lewin, 1935). During interactions in social acts or contexts every participant gains inner experience to become aware of his relations gradually to that act, as a whole, and to other individuals as his co-participants His behaviour is modified under the influence of reactions and interactions of the individuals who are carrying on the social act. "The evolutionary appearance of mind or intelligence takes place when the whole process of experience is brought within the experience of any of the separate individuals implicated therein, and the said individual's adjustment to the process is modified and refined by the awareness or consciousness which he has thus of it or due to 'reflexiveness', i.e., turning back of the experience of the individual upon himself" (Mead, 1934). Experiments conducted in the line revealed that while participating in a social act the participant becomes involved in a social process to be influenced by the attitude of others favouring adjustment to that process (Kutner, *et al.*, 1954; Williams, 1959).

Living in a democratic society, man is expected to promote democratic relationship with family, friends, and neighbours by participating in community life. Children in their school life get the said opportunity in physical education classes particularly, as it stresses fully on learning by doing. Obviously, through formal and informal group activities the participants get chances to enter in learning situations that are helpful in acquiring concepts, attitudes, and skills of democratic life. The activities selected for physical education programme in school, in the *National Plan for Physical Education* (Union Ministry of Education, 1956), provide the way in which the participants can function in relation to another in working to a common goal that was laid down in the Secondary Education Commission Report—"co-curricular participation for educating the group for democratic living" (Union Ministry of Education, 1953).

Physical education is now a part of general education using the process, objectives, activities and methods that have been defined and re-defined in efforts to adopt them both to cultural change and to greater knowledge (Kozman, 1951); it has been recognised, too, as social education aligned with domcratic values particularly due to its group processing effect (LaSalle, 1946). It may be described as a good method to prepare children of a country of social and cultural diversities as a skillful hand of one community under the symbolic unity—Nation—and experimental evidence in favour of this unifying and integrating effect has been already proclaimed by the U.S.A. authorities (Hale, 1959).

Group processing in a physical education programme has been claimed as being potent in creating a suitable field for social learning to generate adequate forces for changing the personality modes of regular participants; since through a continuous conditioning they develop a readiness to take on the attitudes of co-participants and learn to recognise the interrelationships of different roles in team-work. The set of responses are so regulated by rules that correct attitude of one will draw out the appropriate attitude of other (Mead, 1934), due to reflexiveness, and thus the participant learns to adjust in the process and influence others, reciprocally. Under the above frame of reference the present study aims to evaluate the efficacy of group processing to change attitude and improve adjustment status of a group of tribal adolescents of Darjeeling Hills,[1] as would be detected by comparing their pre- and post-programme participation MMPI scores.

PROCEDURE

Programme Selection

The physical education programme selected for present study was composed of a list of highly organised group activity bound by rules and regulations approved by national bodies and prescribed by the Committee on National Planning for Physical Education, 1956, for school children. The list included major games, small area games, scouting, athletics, ralley, camping and educational tour; wherein regular participation implied a regular conditioning to obey a set of rules and regulations favouring democratic living, and where success depends on a successful team-work. The list being placed before a group of fifty professional men connected with relevant teaching activities at different levels and sectors were evaluated as helpful in inculcating the following qualities, necessary for democratic living:

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[1] "In West Bengal, the hill district Darjeeling lies between 26°31″ and 27°13″ north latitude and between 8759″ and 88°53″ east longitude. For economic and security reasons a considerable number of tribal people, mainly Lepcha, Nepalese, and Bhutea, entered there from the neighbouring areas under the invitation of British people in or about 1840 as immigrants and gradually accepted Indian citizenship. According to the last published Census Report there were 267,476 Nepalese, 19,415 Bhuteas, and 14,372 Lepchas. They had a common Mongoloid origin and their original religion was Poonism or Nature worship. Their speaking dialects were different. Because of their common religious mode, racial origin, socio-cultural modes, and recent acceptance of a common vernacular they may be described as an ethnic group, who may have certain common personality characteristics, the modes of which can be traced in a distribution of their personality variants (Linton,1945; Linton,1949) ......for developing and understanding about what is distinctive in them or relatively universal in them. During adolescence different determinants of personality become crystallised (Linton,1949), at least remain in a state for appraisal." (Bose,1971).

Activities	*Qualities as Processing Outcome*			
	Self-responsibility	*Self-assessment capacity*	*Group belongingness and loyalty*	*Understanding others and sharing others*
Games and Sports	94%	96%	88%	76%
Scouting	90%	94%	86%	72%
Camping	78%	72%	94%	94%
Rally	53%	51%	58%	72%
Educational Tour	52%	54%	64%	66%

The list thus selected was programmed according to school routine, round the year, and necessary arrangements were made, as prerequisities to conduct the experiment proper, to orient some key-persons who would help to conduct group processing experiment in question.

Orientation of Key-Persons

The experiment concerned was required to be conducted in the actual social situation with key-persons in the group, active to control group actions aiming at a comprehensive goal (Viteles, 1953). Further, as permissible in 'action research' (English and English, 1958), the author had the privilege to utilise the services of these key-persons to con-

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[3] See footnote 3 on the opposite page.

trol the experiment in achieving useful results and to effect improvement in the on-going process related to regular programme participation in question. The author used his prerogative[4] to orient fifteen teachers with certain basic and essential requirements (Kozman, 1951) of required type of key-person. Those teachers were either officers of Auxiliary Cadet Corps, or of Bharat Scouts, or trained teacher in physical education with coaching proficiency in games and sports. They were connected with the schools which were selected later by the author as venue of the experiment. After necessary orientation, by the author, they were provided with a highly useful chart (Kozman, 1951) and a list of physical education activities, compiled by the author.

Selection of Tribal Adolescent Group

With the help of enthusiastic heads of institutions, tribal adolescents were enrolled for the purpose of experiment from seven well-

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[3]*Category*	*How to be conducted*	*Time allotted*	*Fixture*
A. Games and Sports Football, Hockey, Basketball, Track and Field events, Volleyball, Lead-up Games, and Badminton	Vide Rule Book for Games & Sports (16th Edition) YMCA Publishing House, Russel Street, Calcutta	1½ hour in each working days for Category A, B, and C	A *vs.* B, AB *vs.* any team Inter-schools A *vs.* B teams and AB *versus* AB teams
B. Calisthenics	As taught		
C. Scouting	Vide Handbook for Tenderfoot, Second and First Class Tests, B.S. & G. Publication, Govt. Place, Calcutta	Also during week-end or other holidays	
D. Trekking, Rally, Camping and Educational Tour	As taught	During vacation or suitable holidays	

[4] District Officer for Physical Education & Youth Welfare, Darjeeling District, and Asstt. State Organising Commissioner (Scouts) from 1958 to 1964.

equipped schools, in and around Darjeeling town, populated with tribal children and mostly with tribal teachers. The author during enrolment prepared a list of names of boys who expressed eagerness and interest towards regular participation in the programme after school hours, during holidays and vacations, and another list of names of boys with opposite nature. However, for obvious reasons, finally from each school a group of 10 willing children and 10 unwilling children were selected. The former group had been named as Group A and the latter as Group B throughout the experiment. This grouping was introduced to test whether willful participation and regimentation could produce, in the long run of training, equivalent result. Thus seven willing groups with a total of 70 willing tribal adolescents and seven unwilling groups with 70 unwilling tribal adolescents were formed out of seven school-population for experimental purpose.

Collection of Data

With the help of Nepali version of adapted MMPI, processed by the author to conduct a socio-psychological survey of tribal adolescents of Darjeeling hills (Bose, 1971), personality scores of those 140 children were collected. They were then subjected to group processing, as described under 'programme selection', round the year for a period of two years.[5] The programme was conducted from 3.30 P.M. to sun down in usual working days and during holidays and vacations. Opportunities were given to all boys for group participation in free discussion to develop spontaneity and receptivity; and there were arrangements to activate them in programme planning, after Haas (1948) and Kozman (1951), following role-playing technique in socio-drama. Throughout the period the author used to visit the venues during experimental sessions, as per a schedule, to scrutinise the progress of group processing and for solving queries of the key-persons to run the programme. After two years, the same MMPI was administered on the participants to collect their personality scores.

The scores thus collected before and after programme participation were then statistically compared to determine the effect of group processing. An attempt was made subsequently, after Slim (1958), to compare the MMPI scores of Group A and Group B as that stood at the post-participation stage only. Such comparison assumed that in case the group processing could raise the motivational status of Group B there would be statistically insignificant differences in between two groups of scores under comparison—of course, subject to the condition that the Means of post-participation scores of Group A should not be lower than the Means of pre-participation scores.

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[5] Late 1959 to the end of 1961. Programme under Category D was sponsored by the District Youth Welfare Council, Darjeeling.

DISCUSSION ON THE RESULTS

TABLE 1

Comparison of Pre and Post-Participation MMPI Scores of 140 Tribal Adolescents

MMPI Items	*Pre-participation scores*	*Post-participation scores*	*Difference*
Morale	M=111.06; SD=23.21	M=118·13; SD=28·96	t=3.24* df=13
Social Adjustment	M= 85.63; SD=19.71	M= 89.96; SD=19·53	t=1.64 df=11
Family Relations	M= 75·50; SD=14.36	M= 83.06; SD=18.09	t=3.87* df=9
Emotionality and Temperament	M= 84.50; SD=17.03	M= 88.38; SD=20·57	t=1.62 df=7
Economic Conservatism	M= 30.35; SD= 5.90	M= 30·90; SD= 7.32	t=0·69 df=9

*Difference is significant at 1% level.

Regular participation in the programme processed the group by way of social learning in developing perceptual clarity of self-group relations by harmonising their attitudes, by lowering the degree of affective influences of prejudice and other elements contributive to intolerance. As a result, their attitudes concerning legal and educational system and the nature of their general adjustment were significantly changed—as was evident in their morale scores (Table 1). In a controlled mini-community life their personality-flexibility increased also, as was indicated in SD concerned, and that helped to develop a more liberal attitude towards different social system and institutions around them—relevant to present study. Social adjustment scores of the groups that spoke their attitudes towards social preferences, social mixing, and adapting with new order, along with their inferiority feelings were basically dependent on their tribal traditions and conventions. All those determinants of social adjustment created so serious impact on their personalities that the present processing failed to produce any statistically detectable alterations. The results in Table 1 indicated that simply isolating the small group of tribal children for a limited period of programme participation was not sufficient to minimise the overwhelming environmental influences significantly. Even then the post-participation mean values of social adjustment scores indicated signs of emerging effect of improvement.

The family relations scores, under comparison, revealed a significant difference (Table 1) between relevant attitudes of the group during pre- and post-participation stages. Such change supported the efficacy of present processing in reducing the unresolved tensions of their immediate psychological field (Krech and Crutchfield, 1948) and, thereby, developing more congenial relations with their respective families—due to inculcation of qualities like initiative, cooperation, and loyalty in them, that were claimed as potentialities of group processing in physical education programme (Kozman, 1951).

Pre- and post-participation emotionality and temperament scores of the group could not produce any statistically significant difference. The personality aspects that were appraised by this part of the schedule were health and emotion. Both these were mostly dependent upon heredity, bad regional environment, and some typical ailings of hills (Saul, 1944; Ganguli, 1958). Though their post-participation mean values (Table 1) were tinged with signs of improvement yet the necessity of including proper medical and psycho-therapeutic aids in the programme was felt by the author to induce participants more towards the aspects concerned.

Statistical comparison between two sets of Economic Conservatism scores (Table 1), that reflected their ideas of economic needs and related adjustments at the pre- and post-participation stages, showed no change. Of course, there was no effort to induce participants to delve into the general economic matters because the ethnic group concerned was found much sensitive over political and economic issues. With the spread of general education and broadening of outlook they started only orienting their views over the needs concerned on the basis of their lately formed perspective.

TABLE 2

Comparison of Post-Participation MMPI Scores of Group A (N=70) and Group B (N=70)

MMPI Items	*Post-participation scores of Group A*	*Post-participation scores of Group B*	*Results of comparison*
Morale	M=120.14; SD=28.82	M=116.07; SD=28.93	t=1.54 df=13
Social Adjustment	M= 90.87; SD=18.99	M= 89.07; SD=18.81	t=1.74 df=11
Family Relations	M= 84.89; SD=17.28	M= 81.20; SD=17.32	t=1.23 df=9
Emotionality and Temperament	M= 88.56; SD=18.92	M= 88.23; SD=22.00	t=0.10 df=7
Economic Conservatism	M= 30.70; SD= 6.52	M= 31.14; SD= 7.96	t=0.33 df=7

The key-persons were instructed, as per fixture, to form a combined group of A or willing with B or unwilling participants in some cases and in other cases unwilling ones were to arrange in a separate group to compete with willing ones during processing purpose in physical education class—the procedure implied regimentation under democratic leadership to raise their motivational status (Slim, 1958). The sorted out MMPI scores of Group A on scrutiny were found with signs of improvement as indicated in the post-participation mean values. Such observation encouraged the author to compare the post-participation MMPI scores of Group A with that of Group B (Table 2). The results of statistical comparison showed no significant difference and that spoke in favour of improvement in the motivational status of Group B, by changing their status like that of willing ones. Such effect was also recorded by the author personally and by the key-persons, too, in their regular observation reports.

The deliberations of the symposium on Unity *vs.* Group Isolation in India, held under the auspices of the University Grants Commission, 1958, thought of building up an appropriate psychological environment to minimise tensions in tribal groups due to their failure to identify themselves with the rest of peoples and to develop a feeling of integrity with greater community. According to Mathai (1958) such tension can be eradicated through psychological integration on the basis of motivating them towards a dynamic common purpose. The findings of the present experiment revealed (Table 2) that group processing through physical education had some potentiality towards that end—where the children were processed for a common dynamic purpose of developing qualities or skills for democratic living.

CONCLUSION

The results proved the efficacy of group processing in physical education programme for a limited period on the experimental group in improving the morale and family relations aspects, as appraised by the MMPI, significantly. The obvious fact in the field of educational processing is to expect and wait for an emerging effect. The said expectation had been fulfilled also in the social adjustment aspect of the experimental group, as appraised by the personality inventory in question. Accepting the hereditary and environmental limitations of the experimental group, one should not give up hopes in improving the emotionality and temperament aspects of these children in similar future studies, subject to inclusion of measures suggested under discussion on results. Further, the effect of group processing to improve the motivational status of an unwilling group by becoming willing one due to acquirement of basic democratic qualities had been observed also.

The values of group processing in a physical education programme, in after-school hours, holidays, and vacations, were assumed or theoretically laid down by the Indian experts as helpful to build up a better psychological structure for social and personal adjustment in the formative ages of children and to ensure skills and competency to live in a democratic society (Report of Secondary Education Commission, 1953; Mukherjee, 1953; Mudaliar, 1953; Report on National Planning on Physical Education, 1956; Saiyidain, 1962) and the results of the present study revealed something concrete to support them. It is also expected that tribal children given opportunity to mix up with non-tribal children in motivated group participation in created social situation, as described, would ensure desirable results for cohering them with majority community of our country.

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A Comparison of the Criteria for Identifying Over and Underachievers

Pratibha Deo
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Different investigators have employed different criteria for identifying over and underachievers. These studies show some arbitrariness about criteria selected for identifying over and underachievers, and different cutting points have been accepted by different researchers. Adequate evidence seems to be lacking on agreement between different methods used for identification. This led the authors to undertake the investigation reported here; they have not only compared identification by different methods but also by the same method using verbal and non-verbal tests of intelligence.

The lack of a perfect or very high relationship between intelligence and academic achievement suggested not only the influence of some non-intellectual factors on the performance of pupils in the academic fields, but also the fact that many pupils do not achieve at the level that is warranted by their intellectual abilities. This led to the concept of over and underachievement and, generally, those for whom the intelligence underpredicts are referred to as overachievers and those for whom the intelligence overpredicts are called underachievers. Consequently, researchers showed a considerable interest in studying the characteristics of the pupils that accompanied over or underachievement

(Angelino and Hall, 1960; De Haan and Havighurst, 1961; Frankel, 1960; Goldberg *et al*, 1959; Holmes and Finley, 1957; Perkins, 1965 and others mentioned in the references). However, Deo (1968) has observed that the different investigators have employed different criteria for identifying over and underachievers. Most of these studies have concentrated on the gifted underachievers or the bright underachievers, taking various measures of academic achievement. Gowan (1960) used performance more than one standard deviation below the ability as the indication of underachievement. Goldberg *et al*, (1959) picked up those with 120+IQ whose grades were below 80 per cent of the class standing and these were called underachievers. Holmes and Finley (1957) developed a formula to describe the grade placement deviation as the difference between actual grade placement and the grade placement expected from chronological age +K (a constant). Angelino and Hall (1960) took 120+ IQ students who were below 2.5 on a four-point scale as underachievers. DeHaan and Havighurst (1961) defined underachievers as those in the upper 10th or quarter of their class in ability but whose grades were average or below. Perkins (1965) classified a student as underachiever if his average IQ was 114+ and if the point corresponding to his GPA fell at least one standard error of estimate below the regression line for his classroom. Davis (1964) gives a crude estimate of under or overachievement by taking the differences between comparable scores on an achievement test and on an appropriate aptitude or mental ability test and by comparing it with the smallest difference significant at a designated level of probability, the difference to be calcualted in terms of stanine scores.

These studies show some arbitrariness about the criteria selected for identifying over and underachievement, and different cutting points have been accepted by different researchers. It appears that adequate evidence is lacking on the agreement between different methods used for identification. On the other hand, a recent study by Pippert and Archer (1963) has exhibited variance in the two methods used. In the first method, identification was based on high ability and poor grades, and in the second one, high ability and poor achievement test performance; 14 boys and seven girls were located by poor grades, and seven boys and 12 girls by poor test performances, and only two youngsters were identified the same way by both the methods.

It, therefore, seems that the identification of over and underachievers depends not only on the tools and the cutting points used but also on the specific method applied for identification. There appears to be a high probability that a student may be identified as over, or average, or underachiever depending on the method used. The problem of efficient and accurate identification, thus, assumes fundamental improtance in this field because all the later inferences about the causes and characteristics of over and underachievement would be valid and meaningful only if the process of identification is correct and satisfactory. The authors, therefore, felt the need of comparing the different criteria, and thus undertook this investigation to study the agreement in the different methods used for identifying over and underachievers. It was also thought that the identification which uses the two variables of intelligence and achievement will depend upon what the measures of achievement as well as of intelligence, verbal or nonverbal, have been chosen. The present investigation, therefore, compare identification not only by different methods but also by the same method by using verbal and nonverbal tests of intelligence.

METHOD AND PROCEDURE

Sample

All the 59 students of Class VIII of Model Academy Higher Secondary and Research Institute of Jammu were taken as the subjects. For the uniformity of the measurement of achievement scores in the absence of any standardized achievement tests for all the subjects at that level, and for avoiding the influence of other academic and educational environmental factors on achievement, it was decided to confine the study to only one class from only one school. All the students of the class who were available for testing were included in the sample. Out of the 59 students, 17 were girls.

Tools and Material Used

Achievement Scores. No standardized tests for measuring achievement in all subjects were available. The authors, therefore, had to depend on the class examinations record. To improve the reliability of the achievement scores, the aggregate marks in all the three previous examinations of the class for each pupil were accepted as the achievement scores. The subjects included were English, Hindi, mathematics, science and social studies which were common for all. Optional subjects or arts subjects were not taken into consideration as these refer to some specific abilities and the basis of marking would be different for different subjects.

Verbal Intelligence Scores. For this, the group Intelligence Test in Hindi standardized by Prayag Mehta was used.

Non-verbal Intelligence Scores. These were obtained through Ravan's Standard Progressive Matrices.

Criteria Used for Identification

Various statistical methods and methods suitable to teachers were used to identify the over, average, and underachievement, which are described below.

T-Scores Ratio. All the intelligence tests scores and the achievement scores were converted to T-scores and the ratios of T-scores-achievement to T-scores intelligence were obtained. Those cases where this ratio fell above or below the mean of all such ratios by 1.96 SEm (at .05 level) were identified as over or underachievers respectively. Those pupils for whom the ratio did not exceed the ratios-mean by 1.96 SEm were taken as average-achievers.

Prediction by Regression Equation. After obtaining the regression between achievement and intelligence scores, the achievement scores for each pupil was predicted on the basis of the regression equation. When the difference between the predicted achievement score and the obtained achievement score was more than one standard error of estimate, the case was identified as over or underachiever depending upon the direction of the difference. Those who were neither over nor underachievers were taken as average-achievers.

Stanine Difference. The achievement scores and the intelligence scores were converted to Stanine scores. When the difference between the Stanine achievement score and the Stanine intelligence score exceeded the mean of such differences by 1.96 SE_M (at .05 level), the pupil was taken as over or underachiever being decided by the direction of the difference. Those who did not fall into either category were put into the average-achievers' category.

Percentiles. The achievement and intelligence scores were converted to percentiles on the basis of group scores. The difference between the percentile on achievement and the percentile on intelligence exceeding the quarter of the obtained range of percentiles—differences was taken as the indication of over and underachievement depending upon the sign of the difference. Those who did not fall into any of these two classes were considered as average-achievers.

Teacher's Ratings. Teachers were asked to rate the students on intelligence and on achievement separately on a five-point scale, the gap in the two ratings being two days. The difference in the ratings on achievement and on intelligence for the same student indicated over, average or underachiever reflected by the sign and size of the difference.

Identification by Teachers. In this method, the teachers were asked directly to state whether according to them the students' achievement was above, at par, or below the level expected of their intellectual abilities and the student was accordingly classified as over, average or underachiever.

Data Collection

Thus, data were collected for all the 59 students on their achievement scores, intelligence, verbal and nonverbal tests scores, teachers' ratings for each student on achievement as well as on intelligence, and each student identified as over, average or underachiever by the teachers.

Analysis of Data and Techniques Used

The data collection mentioned above yielded the classification of every pupil in the category of over, average or underachiever by each method, once using the verbal intelligence tests scores and next on the basis of nonverbal intelligence tests scores. The results obtained thus were in terms of frequencies falling into the three categories by each method separately for verbal and nonverbal intelligence scores. The chi-square test, therefore, was applied to test the independence of these different methods. The chi-square obtained was used for calculating C, the contingency coefficient by the application of the formula

$$C=\sqrt{\frac{x^2}{N+x^2}}$$

to get the extent of the relationship. Later, chi-square test was also applied to the test independence of classification by the same method but using the different basis of verbal and nonverbal intelligence scores.

For the significance level of the chi-square test, only the .05 level to .01 level were accepted with the exception of .06 level which is very near to .05 level. This was done taking into consideration the exploratory nature of the study and the small sample taken. All other levels were taken as not significant

RESULTS

Table 1 presents the actual as well as the per cent frequencies of the cases identified as over, average and underachievers by different methods as well as those obtained by using the verbal and the nonverbal intelligence scores separately.

An effort was made to see if each case was identified the same way by all the different methods or if the same pupil was put into different categories by the different methods. This suggested the probabilities of one pupil being put into the same category by all methods; into all the three categories; into the two higher categories, of over and averageachievers; into the lower two categories of average and underachievers; and into the two extreme categories of over and underachievers. These results are presented in Table 2. It was thought that the teachers' method might have contributed to more variation in the classification. Separate calculations, therefore, were carried out for the identification of students into the different categories by all the other methods excluding the two methods involving teachers. These results are also presented in Table 2 for comparison.

The chi-squares along with their levels of significance and the corresponding contingency coefficients calculated for all the methods using verbal inelligence scores are depicted in Table 3.

TABLE 1

Frequencies of Identification by Different Methods on Verbal and Non-verbal Bases including Teachers' Ratings and Identification by Teachers

	Identification on verbal int. scores				*Identification on non-verbal int. scores*				*Teachers' rating*	*Ident. by teachers*
	T-Sc. ratio	*Regr. Eq.*	*St. diff.*	*%iles*	*T-Sc. R*	*Regress.*	*St. diff.*	*%iles*		
O.A.F. % F	16 27.1	11 18.6	14 23.7	17 28.8	11 18.6	11 18.6	13 22.0	17 28.8	14 23.7	14 23.7
A.A.F. % F	20 33.9	37 62 8	29 49.2	27 45.8	31 52.6	29 49.2	26 44.1	22 37.3	34 67.7	13 22.0
U.A.F. % F	23 39.0	11 18.6	16 27.1	15 25.4	17 28.8	19 32.2	20 33 9	20 33.9	11 18 6	32 54.3
Total	59	59	59	59	59	59	59	59	59	59

TABLE 2

Classification of Identification Using Verbal and Non-verbal Bases including and excluding Teachers' Methods

	Identification using verbal basis				*Identification using non-verbal basis*			
	Including Teachers' Methods		*Excluding Teachers' Methods*		*Including Teachers' Methods*		*Excluding Teachers Methods*	
	f	*%f*	*f*	*%f*	*f*	*%f*	*f*	*%f*
Identified the same way	5	8.5	26	44.1	4	6·8	18	30·5
Put in all the three categories	15	25·4	0	0	19	32.2	1	1.7
Put in the two upper categories	23	39.0	16	27.1	23	39.0	20	33.9
Put in the two lower categories	14	23.7	16	27.1	13	22.0	17	28·8
Put in the two extreme categories	2	3.4	1	1·7	0	0	3	5·1
Total	59	100·0	59	100·0	59	100·0	59	100·0
Identified the same way by both verbal and non-verbal bases	Including teachers' methods				Excluding teachers' methods			
	f	%f			f	%		
	1	1.7			8	13·6		

TABLE 3

Chi-Squares and C Coefficients with their Levels of Significance for All the Methods Using Verbal Intelligence Scores Including the Two Teachers' Methods

	T-score ratio	*Regression eqn.*	*Stanine diff.*	*Percentiles*	*Teacher's ratings*
Regression Eqn.	X^2=23.70 C = ·54 Sig. .01 lev.				
Stanine Diff.	X^2=40·21 C = ·64 Sig. .01 lev.	X^2=45·15 C = ·66 Sig. .01 lev.			
Percentiles	X^2=48·17 C = ·67 Sig. .01 lev.	X^2=32.33 C = .59 Sig. .01 lev.	X^2=69·40 C = ·74 Sig. .01 lev.		
Teacher's Rating	X^2= 7.32 C = ·33 Not Sig.	X^2= 5·31 C = ·29 Not Sig.	X^2= 5.20 C = ·28 Not Sig.	X^2= 3·45 C = ·23 Not Sig.	
Teacher's Identification	X^2= 3·97 C = ·25 Not Sig.	X^2= 7·51 C = ·34 Not Sig.	X^2= 5.04 C = ·28 Not Sig.	X^2= 1·59 C = ·16 Not Sig.	X^2=25·02 C = ·55 Sig. .01 lev.

Table 4 gives the same results for the methods using the basis as nonverbal intelligence scores.

TABLE 4

Chi-Squares and C Coefficients with their Levels of Significance for All the Methods Using Non-verbal Intelligence Scores Including Teachers' Methods

	T-score ratio	*Regression eqn.*	*Stanine diff.*	*Percentiles*
Regression	X^2= 6.40 C = .31 Not Sig.			
Stanine Diff.	X^2=40.05 C = ·64 Sig. 01 lev.	X^2=10·78 C = .39 Sig. ·03 lev.		
Percentiles	X^2=66.67 C = ·73 Sig. ·01 lev.	X^2= 5·72 C = ·29 Not Sig.	X^2=47 61 C = ·67 Sig. 01 lev.	
Teacher's Ratings	X^2= 8·99 C = ·36 Sig. ·06 lev.	X^2= 1·88 C = ·18 Not Sig.	X^2= 3.47 C = .24 Not Sig.	X^2= 9.00 C = 36 Sig. ·06 lev.
Teacher's Identification	X^2= 9.65 C = ·37 Sig. ·05 lev.	X^2= 3·99 C = .25 Not Sig.	X^2= 5·75 C = ·29 Not Sig.	X^2= 2·21 C = .19 Not Sig.

The correspondence for identification by the same method by using verbal and nonverbal intelligence scores was worked out by applying chi-square tests. These along with the levels of significance and the corresponding contingency coefficients are shown in Table 5.

TABLE 5

Chi-Squares and C Coefficients with their Levels of Significance for Each Method Using Both Verbal and Non-verbal Intelligence Scores

T-score ratio	X^2 = 7·96 C = .34 Not Significant
Regression Eqn.	X^2 = 30.34 C = .58 Significance .01 level
Stanine difference	X^2 = 38.96 C = .63 Significance .01 level
Percentiles	X^2 = 24.40 C = .54 Significance .01 level

DISCUSSION

A scrutiny of Table 1 shows that the number of pupils identified as overachievers ranges from 11 to 17. This range is not very large, nevertheless, it suggests a disagreement between different methods with respect to identification. The regression method (verbal), T-score-ratio and repression (nonverbal) put the least number of cases as overachievers and the maximum number of 17 has been categorised by percentile method for both verbal and nonverbal basis. This indicates that the percentile method is likely to identify more students as overachievers. Variation in the averageachievers' category seems to be much larger, *viz.*, from 13 to 37. The regression method (verbal) puts the maximum number of cases in this category while the least number comes from the teachers' identification. It also appears that when teachers directly identify students as over, average or underachievers, they tend to classify majority of the students in the underachievers' category which is not corroborated by the figures obtained in the other methods. In the underachievers' category the number varies from 11 to 32, the least number is by the regression (verbal) method and by teachers' ratings when they rate the students on achievement and intelligence separately. It is obvious from this discussion that all these methods do not tally amongst themselves on identification.

To further analyse this phenomenon of the disagreement, Table 2 has presented the frequencies in each category of agreement on identification including the two methods involving teachers. These results show that using verbal intelligence scores as the basis, only five out of 59 students were identified the same way by all the different methods, which in terms of percentage comes to only 8.5. Of these, two were identified as overachievers, two as averageachievers and one as underachieverer by all the methods. And a large number of students, *viz.*, 54 out of 59, which is 91.5 per cent of students could not be identified the same way by all methods; which is a very discuorag-ing factor from measurement point of view, because it suggests that a students' classification as over, average or underachiever will depend upon the method applied. It can also be seen that in the case of 15 students, i.e., in 25.4 per cent cases, the same student was put into all the three categories of over, average and underachiever by the different methods; which means that using the same achievement and intelligence scores, a student by one method can be identified as overachiever, by another method as averageachiever, and as underachiever by a third method. Those who were identified both as average and underachievers were 23 or 39 per cent, and 14 or 23.7 per cent were put into the two higher categories of average and overachievers. There were two cases who were classified in the two extreme categories of over and underachievers.

A similar picture was observed when non-verbal intelligence scores were used as the basis for classification including the teachers' methods. Only four cases or 6.8 per cent cases were identified the same way by all the methods (two overachievers, one average achiever and one underachiever); 19 or 32.3 per cent were put into all the three categories of over, average and underachievers by different methods; 23 or 39 per cent were put into the two low categories of average and under achievers; 13 or 22 per cent were classified as both over and average achievers and there was no case which was put into the extreme categories of over and underachievers. These results show a scanty correspondence between the different methods with respect to the identification. Combining these results with the earlier ones, it can be seen that only one student out of 59, that is, 1.7 per cent was identified the same way as overachiever by all the methods using both verbal and nonverbal bases.

However, Table, 2 shows that a somewhat better picture of this phenomenon is obtained if the classification is studied by all the methods excluding teachers' ratings and identification by teachers. In the four statistical methods using verbal intelligence scores as the basis 26 or 44.1 per cent cases as against five or 8.5 per cent obtained previously are now categorized the same way; no case goes into all the three categories and 16 cases are put under each of the combinations of the two high and the two low categories. Only one case is in the extreme categories. In the nonverbal basis methods, 18 or 30.5 per cent are identified the same way, one or 1.7 per cent goes into all the three categories, 20 or 33.9 per cent and 17 or 28.8 per cent are classified into the two high and the two low categories respectively and three cases go into the extreme categories. Using both verbal and nonverbal bases, eight or 13.6 per cent cases as against one case or 1.7 per cent observed previously are identified the same way by all the methods. This suggests a disparity between the statistical methods and teachers' ratings or identifications, thereby creating doubts about the abilities of teachers for correct identification, a fact which can be verified by the chi-square tests, discussed in the following paragraphs.

It can be seen from Table 3 which gives the values of chi-squares and contingency coefficients for verbal intelligence scores—basis that the T-score ratio method corresponds fairly highly with regression equation method, stanine difference and percentiles method, C ranging from .54 to .67 but not with teachers' ratings (C=.33) or with teachers' identification (C=.25). The chi-squares values for these are considerably high amongst the statistical methods resulting in the rejection of the hypothesis of independence, the values being significant at one per cent level, but quite low with teachers' methods suggesting independence. It appears that all the statistical methods amongst themselves correspond fairly well but low with teachers' method, though the teacher's ratings and teacher's identification agree with each other fairly well where the value of chi-square is high and is significant at one per cent level, and C is .55. The phenomenon of high correspondence between the two methods involving teachers suggests the reliability of teachers' methods. But obviously, the statistical methods and teachers' methods do not agree with each other.

However, a different picture is seen from Table 4 where fairly high correspondence is obtained amongst the different statistical methods excluding the regression equations methods which shows the disparity of the regression equation method with all the other three statistical methods, using the nonverbal intelligence test scores. This implies that with the nonverbal scores as the basis, the regression equation method would yield a classification quite different from the ones obtained by using T-score ratio, stanine difference or percentiles methods. Moreover, except the T-score ratio method, all the other three statistical methods indicate an independence from the methods involving teachers, the chi-square values being small, and not reaching even five per cent level, the values of C ranging between .18 to .29. Only the T-score ratio method yields values of C almost significant at .05 level with both the methods involving teachers, and the percentile method also goes the same way with teachers' ratings. This shows that the soundness of teachers' methods can be obtained only through the T-score ratio method.

It can be seen from Table 5 which gives the chi-squares and C values for identification by the same method between verbal and nonverbal bases that the three statistical methods of regression equation, percentiles and stanine difference show a reasonably good correspondance as reflected by the large values of chi-squares, all significant at one per cent level, and the values of C lying between .54 and .63. A low agreement suggesting independence is observed in the case of T-score ratio method where chi-square is low, and C is only .34 failing to reach even .05 level of significance. Our results confirm the disparity in identification if different bases are used as was observed by Pippert and Archer (1963) where out of 21 underachievers located only two were identified by both the methods of poor grades and poor test performance.

CONCLUSIONS

The different criteria using the same measures of achievement and intelligence do not show a very high correspondence for classification of students in the three categories of over, average or underachievers. A moderately high correlation might prove useful for group prediction but individual classification may vary from one to the other method.

Different classifications may be obtained for the same subjects if nonverbal intelligence scores are used as the basis instead of verbal ones.

The disparities observed in the different criteria as well as in the same criterion using verbal or nonverbal basis suggests that any conclusion drawn in a study on over and underachievers will have to be taken with a caution, and that too, only in the context of the method used, because the application of another method with the same sample might yield a different classification, upsetting the calcuations.

Teachers' ratings or identification by teachers correspond well with each other but lack the support of statistical methods. Teachers' methods may be supplemented by other methods to make them more valid and accurate.

It is very difficult to say which method is best for such identification, but it seems that for judging the efficiency of each method, some suitable external criterion which would be both reliable and valid will have to be devised and used.

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Teacher Initiation-Response Nexus in Different Subject-Matter Areas

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This exploratory investigation was undertaken to find out the type of association between the 'drill' and 'creative inqury' patterns in classroom communication episodes in six subject-matter areas: Tamil, English, mathematics, history, geography and science. Although the association between 'drill' and 'creative inquiry' was not found statistically significant in all the subject areas, association was found to be positive in the case of Tamil and history and negative in the case of other four subjects.

The increasing attention given of late to systematic observation, objective quantification and scientific analysis of the classroom teaching-learning situation, by means of reliable tools is consistent with our efforts at qualitative improvement in education. The tools used should have high prognostic potential and if used carefully and judiciously they can help launch a 'depth-analysis' of the classroom dynamics. By the term 'judicious' we mean using a tool, if necessary, with necessary subscripts for recording nuances in communication patterns.

Of the chiefly contrasting communication patterns in normal classrooms, two are distinctly discernible and call for a special probe on account of their intrinsic significance. As can be visualised, there is on the one hand the 'teacher initiating and pupil responding', and on the other 'pupil initiating and teacher responding'. This distinction, more crucial than even the concept of 'i/d'[1] in the determination of the general 'climate' of the classroom, concerns itself with the important task of 'locating' the originating point of 'initiation'.

Flanders' system of interaction analysis (1965) is chiefly designed to measure the relative occurrences of these two communication patterns. The two contrasting patterns described above alternatively may be called the 'teacher directed drill' and the 'creative inquiry' patterns respectively. It is normally believed that more of 'pupil initiation' and its booster 'teacher response' in the form of appreciation may be associated with greater latitude of freedom for pupils to express their own ideas than will be the case in situations marked by teacher direction evoking pupil talk which perforce is in 'response'. This distinction can be appreciated well if we concede the point that it is students' self-initiated talk which will be characterised by a more democratic climate, rather than their responsive talk which, however frequent and enormous, breeds only a conformist climate in the classroom.

It is pertinent here to point out that the concept of i/d, in terms of its computational nature, does not include the extent of occurrence of the 'students' self-initiated talk', an integral part of the 'creative inquiry' pattern. The concept is a descriptive measure of the teacher talk only as regards the emotional integration manoeuvered by him..

The Concepts Constituting Drill and Inquiry

There are occasions when 'quick, short question, short answer' patterns occur in a classroom situation. Perhaps some teachers are found taking recourse to such drill while opening the day's lesson, some while ending the day's lesson and yet others during the lesson to reinforce and cement the correct responses into the memory structure of the pupils. It is easy to see what various concepts go to make such a drill model. It is invariably characterised by a question by the teacher followed by an answer from a pupil which again is followed by another question by the teacher, and on goes the process of drill.

In terms of Flanders' category system this would create 4-8-4-8

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[1] The i/d ratio is computed by adding the frequencies in categories 1, 2 and 3 and dividing this sum by the sum of category totals in 1,2,3,6 and 7.

....etc., sequence.[3] Thus when the observations are entered in a ten-by-ten matrix, above-average proportion of tallies would appear in these two cells, namely, 4-8 and 8-4. These concentrations indicate the frequent occurrences of the drill pattern in the classroom communication.

However, seldom, if ever, do the drill patterns occur in this, 'short' fashion. It is almost impossible to maintain a pure 4-8, 4-8 sequence for an extended period of time. Invariably there are two common embellishments that happen to these sequence patterns. They are: (1) the teacher takes longer than three seconds to formulate a question, and (2) a pupil requires longer than three seconds to answer it. This 'sustained' nature of questioning and answering gives rise to tallies in the two diagonal cells, namely, 4-4, and 8-8, respectively. The sequences, therefore, turn out to be 4-4-8-8-4-4..... etc., with a few 4-8-4,.....etc., short sequences being interspersed here and there. On a matrix the sequence would be as shown in Figure 1.

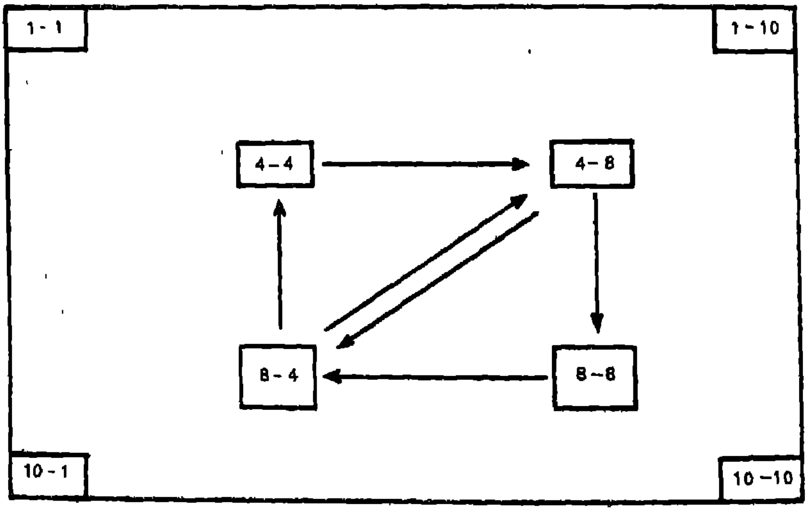

Figure 1

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[3] For convenience the category numbers are shown in a horizontal fashion while in practice normally the numbers are written one below the other in a vertical fashion.

The four constituent cells of the drill pattern and the four arrows connecting them indicating a clockwise flow of communication portray the drill pattern. When it occurs with extended spells of questioning and answering, the two arrows connecting 4-8 and 8-4 cells indicate the 'short' drill pattern.

In contrast to this drill model there may occur, however, infrequent it may be, what is called 'creative inquiry' pattern. This is basically different from the former in that the pupils, to participate in the process of inquiry, should be able to express their own ideas, and in turn, these ideas must be nurtured in a constructive manner by the teacher.

In terms of the category numbers it would mean a series of 9's followed by a series of 3's. The sequence would be like 9-9-9-3-3-3-9 .....etc. This involves four cells of the matrix, namely, 9-9, 9-3, 3-3, and 3-9. If, within the matrix, sizeable concentrations are discovered in these four cells that would imply the presence of the 'inquiry' process in the classroom verbal interaction.

Figure 2 illustrates how the interconnections occur which go to make the inquiry process.

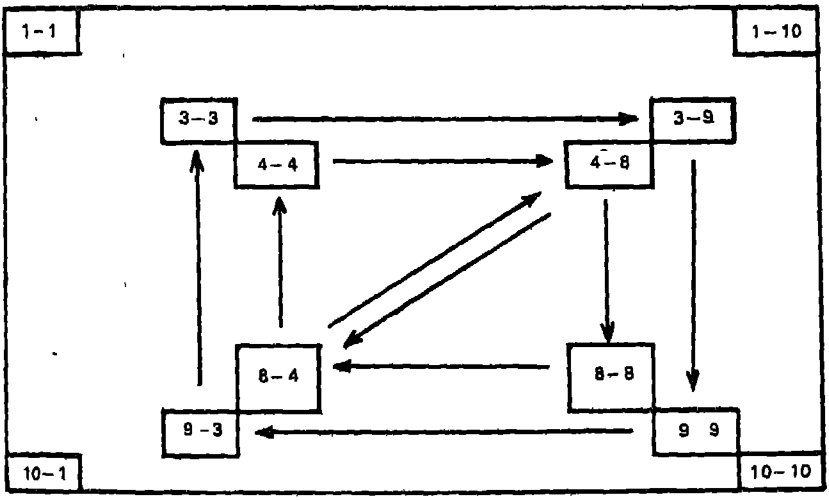

Figure 2

In Figure 2, both 'drill' and 'creative inquiry' patterns are depicted. While the 'inner' square of arrows represents the 'drill' the outer square depicts the 'creative inquiry'.

The distinctive difference in these two contrasting patterns clearly is that while in the drill pattern the writ of teacher's direction runs large, in the 'creative inquiry' process the pupils have and are allowed to have a wider latitude of freedom to express their own ideas to which the teacher responds with appreciation and constructive use. The initiative in the former lies with the teacher, the pupils having to respond straightaway to the stimuli while in the latter the initiative rests with the inquisitive pupils, the teacher wholeheartedly responding and encouraging such creative inquiry.[8] The 'creative inquiry' radiates a warm personal touch by the teacher in terms of constructive integration and effective mobilisation of pupils' potentiality while the 'drill' pattern, though appropriate and useful in some situations, smacks of a relatively impersonal and down-to-business attitude of teachers which breeds only conformity. The relative distribution patterns of tallies in these eight cells give us a clue to the nature of teacher initiation and response balance in the communication episode observed.

Rationale

The rationale underlying this investigation which seeks to study the relationship between these two contrasting patterns is the belief that there may be some kind of association between these two behaviour patterns. Perhaps, where the teacher is more inclined to usher in only 'drill' there might be lesser scope left for 'creative inquiry' as will be the case when the questions put by the teacher are 'closed' requiring 'predictable' answers from the pupils. Or, in some cases it may be possible that the questions may be 'open-ended' ones which permit the pupils to come out with their own ideas which may trigger an 'inquiry' process. In the second case, it may be found to be a 'complement' to the drill. The nature of relationships if found to exist as in the first type would be negative while on the other hand if it suggests the latter type it would be positive.

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[8] The transitions that the teacher can manoeuvre to transform a drill pattern into a more useful inquiry process are beyond the scope of this paper.

Objective

The objective of the explorative investigation is to find out the type of association between the 'drill' and 'creative inquiry' patterns in classroom communication episodes, in different subject-matter areas.

Sample

The sample for the investigation consists of 32 teachers, 16 of them male and the other 16 female teachers drawn at random from the upper primary schools of the metropolitan city of Madras. All the 32 teachers are teaching their respective classes all the six school subjects which are Tamil, English, mathematics, history, geography and science. Each teacher was observed for one full hour of two half-hour spells, in each subject.

Tool

Flanders' system of interaction analysis of ten categories was used for the investigation.

Procedure and Methodology

With a view to controlling as many of other factors as possible, it was decided that all the teachers teach the same teaching units in the different subjects. Observations were made after securing the full consent of the teachers concerned. The observations were preceded by systematic training of the observers who demonstrated an inter-observer reliability of over .85, in terms of Scott's coefficient. The observations of each teacher in each subject were cast on ten-by-ten matrices. The two matrices of half-hour duration each in respect of each subject were combined to form one matrix representing the interaction for one hour. In this way, there were six different matrices of each subject, for every one of the 32 teachers.

The cell loads of cells 4-4, 4-8, 8-8 and 8-4 in the matrix were added for each subject, and for each teacher, to give us the extent of occurrence of 'drill'. Likewise the loads in the four cells 9-9, 9-3, 3-3 and 3-9 were added for each teacher and for each subject which gives us the extent of 'creative inquiry' that occurred in the interaction spell observed. Actually these tallies are viewed as so many behaviour acts and are treated as raw scores of the teachers in the respective subjects.

Correlation coefficients by the rank-difference method were computed. The rank-difference correlation coefficients for the six different subjects are given in the table. For determining significance, table values of correlation coefficients at the five per cent and one per cent levels of significance for 30 (N-2) degrees of freedom were consulted. (*Statistics in Psychology and Education* by Garrett, 1969).

TABLE

Rank-Difference Correlation Coefficients (p)

No.	*Subject*	p	*Interpretation*
1.	Tamil	0.09449	Not significant
2.	English	-0.22507	Not significant
3.	Mathematics	-0.08412	Not significant
4.	History	0.07442	Not significant
5.	Geography	-0.19657	Not significant
6.	Science	-0.23487	Not significant

Discussion of Results

It is seen from the table that the association between 'drill' and 'creative inquiry' in all the six different subjects is not found significant for want of statistical evidence. However, it is interesting to see how the association is found to be positive in the case of Tamil and history while it is negative in the case of the other four subjects.

Summary

The frequently occurring but mutually contrasting patterns of 'drill' and 'creative inquiry' help us to gauge the teacher initiation-response balance in the classroom interaction. A probe of this nexus might give us a clue to the type of association, if any, that subsists between these two patterns. Within the framework of the investigation done, there was no statistical evidence to conclude that there exists any such relationship. However, the relative measures of the rank order correlation coefficients arrived at indicate a positive association between these two patterns in Tamil and history while a negative association is suggested in the case of the remaining four subjects.

Suggestions

It would be useful, it is believed, if explorations of this nature with larger samples tailored to control various extraneous factors likely to be operating in this context, and with more rigorous research designs, could be undertaken. It is pertinent here to point out how in our study the correlations in the case of English and science are marginally falling short of the critical values required for significance at five per cent level of confidence.

Research efforts made in this direction are possibly fulfilling the expectations of Ned A. Flanders spelt out in the course of his introduction to *Interaction Analysis—Theory, Research and Application* by Amidon and Hough (1967).

Buch and Santhanam (1970), while reporting their findings, state "acceptance of students' responsive ideas is 1.21 per cent while the students' self-initiated talk is acknowledged to the extent of 0.56 per cent. The former is over twice as much as the latter. This relationship lends added significance to the finding that teacher-controlled student talk (17.91 per cent) was nearly six times the students' self-initiated talk (3.25 per cent)." Perhaps this serves to indicate that relatively greater emphasis on pupils' responsive talk would result in a reduction of the occurrence of pupils' self-initiated talk, and more so of its constructive acceptance by the teacher. Here, of course, we do not hazard a generalisation that the more a teacher responds to pupil behaviour the more pupils would learn. Occurrence and acceptance of pupils' self-initiated talk and pupils' learning may *not* bear a linear relationship at all levels. Although we may at best say that it requires strong empirical proof to state that there may be an 'optimum point' at which higher levels of the 'pupil initiation-teacher response' might begin to erode efficient learning by pupils, we may do well here to refer the work of Soar (1968) who has reported some 'curvilinear' relationships between interaction variables and measures of pupil achievement. Perhaps one can concede the need for pupil initiation and its booster, teacher acceptance, for enabling the bright and the inquisitive pupils to reach those levels of cognitive functioning that require independent thinking and self-direction. But then, there can be no gainsaying the fact that a certain amount of teacher initiation is also required in the classroom for effective guidance and direction.

It would be immensely useful if further research in this aspect is directed towards discovering the points of optima, if any, that these two distinct patterns bear vis-a-vis pupil learning.

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Social Pressures Toward Learning and Performance

Santokh Singh Anant

The author summarises research in the area of social pressures and influences in group functioning. He brings out the factors which contribute to the acceptance of these pressures and influences and explains their implications for education.

Group life and group functioning is to a certain extent made possible by the social pressures and influences impinging upon the group members. Entering a group involves acceptance of several beliefs, standards and opinions, which are common to all members belonging to it. Then, within the group, there are pressures toward uniformity, which are usually a function of the cohesiveness of the group. These influences and pressures are reciprocal. An individual tries to influence others to accept his beliefs and is also willing to be influenced by them. If a member does not accept the beliefs of the group and/or is not prepared to accept the pressures of the group, he may feel that he does not belong to the group and would like to leave it (Anant, 1966). But he is free to leave only those groups which he joins of his own accord, and which are called 'voluntary groups'. He is not free, to the same extent, to leave involuntary groups, such as family, community, etc. The nature of the voluntary and involuntary groups depends upon several factors. A voluntary group may, because of its cohesiveness, be as binding as an involuntary group. It may be even more attractive to the individual, because of its importance for the satisfaction of several of his needs. He may enjoy his membership in the group and may devote more time to the voluntary groups than to the groups which he is not free to leave. An example would be some peer groups in the school or college which acquire much importance in the student's social life. Thus, the groups which the individual is free to leave may become more binding to him than the groups to which he is bound by the circumstances of his social living. He may be willing to accept several pressures and influences from these groups.

A question worth consideration in this context is: Where does the school as an institution stand? Is it a voluntary group or an involuntary one? Why does the child accept the influences of the school? What are the pressures which make the child attend the school and perform well in its studies? These are the social pressures of the family, the society, the peer group and several other such influences. In this paper, a brief summary of the research in the area of social influences on group functioning will be presented. Then, on the basis of these investigations, certain generalizations as to their value for the study of social pressures on the child, which make him to learn and perform well in the school, will be made.

Research on Social Influence

Several investigators have investigated the social influences and social pressures toward group functioning: Back (1951), Blake and Morton (1957), and Festinger, *et al.*, (1960), studied the dynamics of influence. Some others (Brehm and Festinger, 1957; Harvey and Consalvi (1960), considered the pressures toward uniformity. Still some others (Lippitt *et al*, 1952; Flanders and Havumaki, 1960; Hurwitz *et al.*, 1960 and Stephenson, 1959) investigated the effect of power as an influence. Another group of investigators (Harvey, 1960; Polansky, *et al*, 1950; Videbeck and Bates, 1959) studied the reciprocity of influence. Milgram (1965) reported an experiment in which group pressures are used to make the subject perform desirably rather than undesirably.

Back (1951) hypothesized that the pressures toward accepting the same beliefs would be stronger among the members of the same group than among the members of different groups. Within a group, these pressures would be a function of the cohesiveness of the group. Thus, with increase in cohesiveness there would be an increase in the pressures toward uniformity. The experiment consisted of an interpretation of a set of pictures. The study supported the main hypotheses of the investigator. High cohesive groups exerted more influence than the low cohesive ones. The members of the high cohesive groups tended to feel less resistant to their partners' attempts to influence them than did the members of the low cohesive groups. These results can be interperted in terms of the individual's identification with the group. In high cohesive groups, the more attraction toward the groups is partly due to the identification of the individual's goals and aspirations with the goals and objectives of the group. He is willing to accept pressures and influence because he sees better satisfaction of his needs in the group.

Blake and Morton (1957) found through a series of experiments involving exertion of influence that the behaviour of others present in the environment is a weighty factor in influencing the specific manner in which people react in concrete social situations. The status of the person influencing the response was also important. Similar results are reported by Polansky, *et al,* (1950), who found that the individuals with high group prestige make more attempts to influence others, but are more resistant to the attempts at influencing them. These results can be interpreted in terms of the school situation as well. We can anticipate that the child will make more attempts to perform better if other children in the class, or in his peer group, are doing so. Even the influence of his siblings may be an important factor in his performance. The experiments performed by Blake and Morton showed that the prohibition is usually determined jointly by the strength of the prohibition, and the perceived reactions of others to it. The status of the person violating a certain principle is also important. If most of the children in the class violate some social or moral taboo, the child is more likely to go along with them. Again, the influence will be more pronounced if the teacher or the elder boys and girls violate it.

Festinger, *et al,* (1960) formulate that the pressures which a group exerts on its members may be overt and formalized or subtle and difficult to locate. The strength of the pressures depends on the attractiveness of the group, and degree of communication among the members. In their paper, conformity has been discussed as a function of the power of the group over its members, which is in itself a function of the cohesiveness of the group. The effect of group pressures may be different on different individuals. This was shown by Canning and Baker (1959) who performed an experiment to study the effect of group pressures on authoritarian and non-authoritarian persons. It was hypothesized that the authoritarian persons would be affected to a greater extent by group pressures than the non-authoritarian persons. It was also expected that the subjects would be influenced by group members without being aware of it, which is an indication of the internalization of group norms. The results supported both the hypotheses. These findings supported Adorno's (1950) finding that the authoritarian person is constantly afraid of not being like the others and is 'inclined to submit blindly to power and authority'. The aim of education in the present era should be to develop non-authoritarian (democratic) personalities who would be able to freely express their opinions and beliefs, and cooperate in group living, through retaining their individualities. Social pressures in this condition would be accepted because of their appeal and value, and not because of some inner conflicts in the life of the individual.

Festinger, in his theory of cognitive dissonance, states that 'whenever there are differences in opinion or ability levels that are relevant in a group, there will be pressures to reduce those differences'. In line with this theory, Brehm and Festinger (1960) conducted an experiment to test pressures toward uniformity in those who sored above others in a group. It was found that there is a tendency to affect the scores of other persons so as to bring them close to one's own performance, where there is discrepancy between the two. It was also found that if the members are following their egoistic motives in a competitive spirit, we might not expect this sort of result. Thus, once again, group cohesiveness was found an important factor leading to uniformity of beliefs, opinions and performance.

Harvey and Consalvi (1960) tested the assumption of the goal-gradient theory that the person will stick to the goal more firmly, the nearer he reaches it. The greatest conformity to group pressures was found in the second-ranking member. The second-ranking member is very close to the goal of leadership. His main endeavour is concentrated on the attainment of the top position. In order to remain popular with the group, he conforms to all kinds of pressures from other group members. The leader, if secure in his position, is not so much concerned about conformity to pressures. On the other hand, the lowest ranking member has nothing to aspire to, as he is very far from the top position. Thus status of the person was found to be another important variable in determining the conformity to social pressures.

Lippitt, *et al.*, (1952) investigated the process of social influence in groups of children. They found that the behaviour of a member with high attributed power is more likely to be contagious (a term used for spontaneous pick-up or imitation by other children of a behaviour initiated by one member of the group where the initiator does not display any intention of getting the others to do what he did). The reason why the low-powered members tended to follow the behavioural responses initiated by the high-powered ones seems to be the need of the former to move toward the goal of greater social power, which they could, presumably, achieve more effectively if they initiated the behaviour of people with greater power. In another study, Polansky *et al.*, (1950) had found similar results. Individuals with high group prestige were found more effective in influencing others. Closely related to this is the nature of conformity to dominative teacher influence. Flanders and Havumaki (1960) discuss the patterns of teacher influence. Given the differences of opinion, a teacher usually exerts logical persuasion, explains the problem as he sees it, outlines certain facts or reasons that support his point of view, and frequently asks questions designed to stimulate student discussion. In their study they used two patterns of influence. In one pattern, the teacher directed his arguments only to the individuals, while the rest of the group listened. In the other, he directed his arguments to the total group. They found that a constant force toward conformity may be considered the logical argument of the teacher. When there is conflict between the teacher's approach and the approach of the group, the latter would be a stronger element toward conformity. A teacher who sets out to persuade a class to shift its opinion by 'divide and conquer' technique is likely to find this method very successful, but also likely to produce inner resistance. Stephenson (1959) also found the democratic leaders, who created an atmosphere of approval, better in getting cooperation from their followers.

Harvey's study (1960) was concerned with the reciprocal influences of the leader and the members of the group. He found that the extent of the influence depends upon the type of the leader. The formal leader (appointed, but not the choice of the group members) is most influenced, while the formal-informal (officially appointed as well as the choice of the group) was least influenced. The influence was found reciprocal in that the leader not only influenced other members, but was himself influenced by the members of the group. Same is probably true of the teaching-learning process. The teacher influences the pupils through her teaching, but also adapts it to the needs of the pupils. The feedback from the pupils is an important influence in the planning of her teaching. Milgram's (1965) procedure provides an ideal setting to study the possible positive or 'liberating' aspects of group pressure when a large number of subjects behave distinctively.

Implications for Education

The above summary of the research in the area of social pressures and influences in group functioning brings out the following factors, which contribute to the acceptance of these pressures and influences:

1. Group cohesiveness or the attraction of the group
2. Status of the person exerting influence
3. Environmental factor, that is, what others are doing
4. The nature of the atmosphere, that is, democratic or authoritarian.

The social pressures on the child, making him learn, and perform well usually come from his family, the peer group, the community, the teacher, etc. The family is a well-knit, permanent, cohesive group. Most of the needs of the child are met. So, the child is attracted to his family, and cannot risk leaving it without serious repercussions for him. The family wants the child to go to school and to perform well there. These pressures come from the parents, who hold the dominant position in the family, enjoy higher status, and are in a better position to influence the child. The child may be ridiculed if his performance falls below a certain standard. It can be hypothesized that the level of performance expected of the child will vary from one socio-economic class to another. A middle class family may put more emphasis on the scholastic performance of the child than a lower class family (Devis, 1955).

Again, the peer group, including the sibling group of the child is an important influence in determining his level of performance. It has been found in several investigations that the pressures put by the peers are very much binding on the person. In industrial set-up, the adult peer groups have the same effect. It has been shown that these groups decide upon a standard of performance for the members, and any member deviating from the standard is pressed to bring his performance to that level (Mayo, 1933). If all the children in the group are hardworking and are performing well in the school, a child who is not performing well may work hard to reach the standard of the group. Otherwise, he is liable to be ridiculed by other students in the group. Peer group influence is important because of the fact that peer group is a high-cohesive group and is attractive to the child. What other pupils in the class, and in the peer group, maintain as to the standard of performance is, thus, an important determinant of child's efforts. This effect of environmental factors is relevant not only for the learning of school subjects, but also for learning of moral principles. Violation of a social or moral principle becomes easy for the child, if others are also doing so. But, he will abide by all the taboos and rules if other children abide by them. Another important influence here is the status and prestige of the person violating the principle. If the teacher or the elder pupils do it, the child will be influenced more than when only the peers are involved in the violation.

The acceptance of a social pressure of influence would depend in part upon the personality of the child. An authoritarian child would accept the influence easily, but not rationally. So, any time, he is liable to act against all those principles which he had accepted, without reasoning. On the other hand, a non-authoritarian child would accept the influences and pressures, but he may also reason out why he should do it. Thus, the effects would be more lasting and desirable. It is also clear from the studies discussed that a persuasive, democratic influence is accepted much more easily than the autocratic commands. The teacher should present his point with persuasive arguments and reasons, in order to be accepted by the class. But the value of persuasive argument may vary from one level to another. They may become more and more useful with the advancing age of the child.

These factors should be investigated in the specific set-up of the school. Investigations should be conducted to find out the relative emphasis on scholastic performance by various socio-economic classes; the varying influences of persuasive pressures and commands; the effect of the status of the person exerting pressure; and other related factors. It is worthwhile to find out the value and importance of social pressures on learning. It could be that the pressures are not very strong, still the child attempts to learn and perform well because of his curiosity, exploratory tendency and interest in the material. Or, the pressures are not forthcoming from the proper source, i.e., the parents of the child are not taking much interest in his studies. In a competitive social set-up, even the spirit of competition may be responsible for effective performance. All others are making efforts to learn and obtain higher education, so he should also do so.

We may conclude this article by listing some propositions on social influence. Collins (1970) discusses the following propositions and presents evidence in support of the same:

1. The greater the personal attraction felt by group members toward an individual, the greater the potential social influence of that individual.
2. The greater the interpersonal attraction among the members of a group, the greater the mutual social influence among them.
3. Punishment-based power (a) does not lead to interpersonal attraction, and (b) inhibits the amount of social influence based on interpersonal attraction.
4. Under conditions of interdependence, common fate and shared goals, individuals develop interpersonal attraction (liking).
5. Evidence of, or reputation for, competence increases social influence.

Basic education is an excellent example of a system which tends to bring school and community closer on a give-and-take basis and makes the school a training ground for adult life. Unfortunately, there are very few authentic basic schools in the country. It is hoped the factors discussed earlier and the above propositions will be of some help to teachers in the planning and organization of group activities in the school, so that these activities become a focal point of learning. In order to make education really a preparation for life, we should emphasize the social aspect of learning.

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Sex Differences in Value Patterns of Adolescent Students

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In this pilot study of the value patterns of Indian adolescents, the authors have investigated sex differences in expressed values among members of the same socio-economic group. They administered the Allport-Vernon-Lindzey Values Inventory to 100 arts and science high school students (50 girls, 50 boys), selected from the middle socio-economic group by means of Kuppuswami's (1962) socio-economic status scale. Other variables like academic achievement, mother tongue and religion were also controlled. The findings generally lead to the conclusion that sex differences in values do exist on the aesthetic and social scales.

The deep and persistent interest of our society in the subject of sex differences in a range of areas of human concern is demonstrated by the extensive literature on this subject. These empirical studies have shown conclusively that significant behavioural differences do exist between men and women. The major factor in these differences is, of course, generally agreed to be the social and cultural incentives and pressures which train men and women for their respective sex roles within the family and society. (Tyler, 1956).

During the past few years there has been a great deal of interest in various aspects of small group behaviour. Sex differences in group behaviour has not as yet occupied much research interest, though there is a growing body of knowledge concerning sex differences in various aspects of individual behaviour (Anastasi, 1958).

Psychologists have long recognised that the differences between the sexes in most mental functions are either exceedingly small or of questionable human significance. All laboratory studies have shown that variations in performance within the male and female groups are far greater than those occurring between their respective means (Allen, 1927).

Vernon and Allport (1931) investigated the values of the male and female subjects by the 'study of values', a test of values constructed by them and the original findings revealed that men scored higher than women on theoretical, economic and political values but lower on aesthetic, social and religious values.

Cantril and Allport (1933) reviewed a number of early studies on sex differences in value preferences and found that men scored higher on theoretical, economic and political values, while women scored higher on aesthetic, social and religious.

Hartman (1934) found that the rank order of values for men was political, theoretical, economic, religious, social and aesthetic, while for women, the order was religious, aesthetic, social, political, economic and theoretical.

Symonds (1936) presents remarkable findings concerning values of the adolescents. He found that the adolescent boys considered money their principle problem, while the adolescent girls, personal attractiveness.

Duffy (1940) has observed that there are characteristic differences among the evaluative attitudes of students in different colleges, students in different fields of study, and between men and women. She found that men score higher on theoretical, economic and political values, whereas, women score higher on aesthetic, social and religious values.

Spoerl (1952) found that women at American International College differ significantly from men on all six scales of A-V-L 'study of values'. The former are significantly higher in aesthetic, social and religious values, and significantly lower than men in theoretical, economic and political values.

This paper is based on a study undertaken to investigate the value patterns of adolescents. It will be of great significance to find out what we value most in our lives. The rapid modernisation of society is producing deep impact upon the attitudes and value systems of persons and their failure to adapt themselves to changes may be a source of great tension and unrest.

Problem

Since psychological research typically requires generalization from small samples of persons and still smaller segments of their behaviour, the characteristics of subjects deserve critical attention. This has long been recognised in general terms and practised with respect to variables such as, age, sex and socio-economic background, etc., where they were obviously important. Psychological studies of values on the secondary school level are notably lacking with a few exceptions.

It was, therefore, proposed to carry out a pilot study of the value patterns of the adolescents in our country. Previous studies of values with inventories have shown that value inventory scores are related to sex differences, to various occupational differences but not to abilities and academic achievement (Hartman, 1934).

The present study investigates sex differences in expressed values among members of the same socio-economic group. Various studies have shown concvlusively that significant behavioural differences do exist in men and women and also in their value patterns (Hartman, 1934. Spoerl, 1952 an Symonds, 1936). The major factors in these differences is, of course, generally agreed to be the social and cultural incentives and pressures which train men and women for their respective sex roles within the family and society.

Procedure

The Allport-Vernon-Lindzey Value Inventory (1960a) was administered to a group of 100 arts and science high school seniors, 50 girls and 50 boys of the 9th and 10th special classes. They belonged to a local government girls' school and zila school at Muzaffarpur, which is a divisional headquarters in the State of Bihar.

Members of both groups have been selected from the middle socio-economic group by means of socio-economic status scale developed by Kuppuswami (1962). With regard to their academic achievements, they belonged to the middle grade, that is, they had obtained between 45 per cent to 55 per cent marks in their last annual examination. Other variables like mother tongue and religion have also been controlled. Only those students have been selected for this study who have had Hindi as their mother tongue and professed Hinduism. The median age of all the students selected for this study is 16 years with a standard deviation of .88.

Results

TABLE 1

Sex Differences in Six Value Patterns as Indicated by Scores on the Allport-Vernon-Lindzey Scale of Value Test of 50 Boys and 50 Girls

Values	*Subjects*	*Mean*	*Range*	*SD*	*SEm*	*Mean*	*C.R.*
Theoretical	Boys	50.2	20 (39–59)	7.106	1.004	1.4	1.06 (NS)
	Girls	48.8	21 (36–57)	5.76	0.81		
Economic	Boys	34.7	15 (28–43)	6.05	0.85	0.9	0.8 (NS)
	Girls	35.6	25 (24–49)	4.95	0.70		
Aesthetic	Boys	34.9	22 (25–47)	5.11	0.73	3.0	2.8 (HS)
	Girls	37.9	24 (24–48)	6.25	0.80		
Political	Boys	43 2	19 (36–55)	4.90	0.67	0.2	0.19 (NS)
	Girls	43.4	20 (34–54)	5.51	0.77		
Social	Boys	47.1	14 (39–53)	2.90	0.41	3.1	3.4 (HS)
	Girls	44.0	23 (33–56)	4.90	0.80		
Religious	Boys	29.2	28 (15–43)	7.60	1.97	0.4	0.25 (NS)
	Girls	29.6	24 (18–42)	8.77	1.20		

N.B. : df=49, at 0.25 level of significance
t=between 2.02 and 2.01
At 0.01 level of significance, t=2.68.

The most lucid representation of the results is shown in Table 1. From a comparison of scores obtained by boys and girls, the latter have scored a significantly higher value on the aesthetic scales than the boys. On the other hand, the boys have scored significantly higher value on the social scale than the girls. Table 1 gives the results of the statistical analysis of the scores obtained by the two groups in each of the value patterns.

On the whole, the findings reveal that the girls score higher on aesthetic and economic value scales than boys, while the boys, more on social and theoretical. They do not show apparent differences on the political and religious scales.

It will be observed here that all the differences between the means are not in expected directions. These findings do not conform to the findings of the Western investigations. In this study it is also revealed that the feminine ideals and standards to a great extent run parallel with masculine values (taken as a group). aHrtman (1934) found that the two groups (male and female) failed to run parallel in their ideals and standards. The implication of this may be that sex differences in attitudes and values are disappearing due to rapid changes in social life. However, higher value scores of the girls on aesthetic and religious scales do conform to the established findings. (Cantril and Allport, 1933; Hartman 1934; Vernon and Allport, 1931).

TABLE 2

Rank of Each Value Pattern for Boys and Girls, according to the Mean Score

Rank	*Boys*	*Mean*	*Girls*	*Mean*
1.	Theoretical	50.2	Theoretical	48.8
2.	Social	47.1	Social	44.0
3.	Political	43.2	Political	43.4
4.	Aesthetic	34.9	Aesthetic	37.9
5.	Economic	34.7	Economic	35.6
6.	Religious	29.2	Religious	29.6

The results of the application of t-test to the differences yielded by adolescent boys and girls show that the latter scored significantly higher than the former on the aesthetic values and on the other hand the former scored significantly higher than the latter on the social values. No significant sex differences in values have been found on the other four variables, that is, theoretical, economic, political and religious. This may perhaps be tentatively explained by the fact that boys and girls of the present generation, being exposed to the impact of scientific and technological developments and of political activities, are acquiring similar values in life, and whatever sex differences were in evidence before are being obliterated gradually, especially in these areas.

Conclusion and Discussion

Findings in general lead to the conclusion that differences in values do exist between adolescent boys and girls on aesthetic and social scales because the latter have different dispositions and family background.

TABLE 3

Critical Ratios Indicating Relative Difference between the Two Groups (Boys and Girls)

Value	*Critical Ratio*
Social	3.4
Aesthetic	2.8
Theoretical	1.06
Economic	0.8
Religious	0.25
Political	0.19

The adolescent girls are found to be very sensitive to 'beautiful' because of their dominant interest in form and harmony. A higher mean 'aesthetic' score reveals that the girls have high appreciation of all that is beautiful and pleasing. The adolescent boys have significantly higher 'social' score as revealed by mean difference and critical ratio. It has been observed that women are presumably more social having dominant interest in the service of people. But the findings of the present study do not support the findings of the Western psychologists (Cantril and Allport, 1933; Hartman, 1934). The boys have shown more sociability than the girls. The boys have higher 'theoretical' scores revealed by mean difference. It has been observed that men are presumably more concerned with ideas or search for truth than women. The present study supports the view though not significantly.

It will be observed here that the differences between the means of economic, political and religious value scores are not in expected directions. The low rank order given to religion indicates that the two groups do not include it in their higher level value patterns. No significant sex difference is observed in the religious, political and economic life of the adolescent students studied here. This finding does not conform to the findings of the Western psychologists, (Hartman, 1934; Spoerl, 1952). This may be analysed in the light of the deep impact of the modernization of Indian society, specially in the urban areas, where boys and girls are acquiring similar value patterns in life. Like boys, the girls do not show preference for either religious persons or religious ideas. It is well indicated by the negligible difference between their mean scores. The girls appreciate progressive and sophisticated aspects of life, to conform to the modern ways of living. Temperamentally girls have more aesthetic sense than boys and this has been shown in this study. The reason for the boys having scored higher than girls on 'social' factor may be that up till now the former have played a more important role in society than girls. It is only in recent times that girls are being given some freedom in the social activities. The reason why the value patterns of adolescent boys and girls have not shown any significant difference in such dimensions as economic, political, religious and theoretical, may be explained as being due to the impact of rapid changes in all these aspects of life.

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A Review of Research in Classroom Group Behaviour

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The author reviews research in classroom group behaviour, taking in significant studies conducted between 1939 and 1965, under the following heads: nature of groups, cohesiveness, communication, structure, norms, goals, group composition, instructional leadership and frustration. He then deals with techniques for changing group behaviour.

How to help children to develop and accept desirable standards of conduct? Can they be helped in a class group? If so, what are the characteristics of classroom groups? What are the factors that influence group behaviour in the classroom? What is the effect of the group upon individual behaviour? These are among the questions raised by educators, especially those concerned about and responsible for actual classroom teaching. There are no easy answers.

Examination of research on classroom group behaviour may raise as many questions as it answers, especially in the unexamined areas of classroom group behaviour and its influence upon the individual child. The findings set forth below are from reviews of evidence available.

Keeping of discipline is the greatest problem of teachers as revealed by various investigations including an extensive study of pupil behaviour involving 10,000 classroom teachers and conducted by the U.S.A. Government (National Education Research Division, 1956). The problems that teachers have labelled class management, class order, class control, and discipline are for the most part problems of classroom behaviour.

Authors like Hopkins, Baxter, Cassidy, Bradford, Trows, Cunningham and Macknezie have viewed the class as a group. The recent focus upon group psychology has emphasised the consideration of class as a group and what this implies for teaching practice.

In spite of the recognition of class as a group and knowing that teachers have been plagued for years by problems of classroom behaviour, educators have been slow to apply significant findings from group research to classroom practice. In addition, there is a tendency to emphasise the individual, to use vague terms, to criticise the use of group techniques in education, and to avoid findings of precise exposition of relevent psychological knowledge of groups, and how much knowledge relates to actual classroom methodology.

Nature of Groups

What are the general properties that all groups have in common? Bany and Johnson (1965) described them as follows: (1) Communication or interaction, (2) An organisation or structure, (3) Unity or Cohesiveness, (4) Common motives or shared goals, (5) Power to standardize behaviour or norms, and (6) An observable pattern of behaviour resembling what is called personality in an individual. These properties vary in dimensions in different groups.

What are the major characteristics of class groups ? These have been described as follows: (1) Group cohesiveness, (2) Interaction, (3) Structure, (4) Group norms, and (5) Group goals. It would be useful to know in some detail as to what each of these characteristics means for a classroom teacher.

Cohesiveness

Educators regard the class group cohesiveness as a condition where children in the class are strongly motivated to become involved in group activities and in group affairs. But how to know whether a class group has cohesiveness or not ?

The members of a class group can be said to have cohesiveness when they bind together in case of an outside threat, when they are helpful to one another, when they are able to plan together and to solve problems of mutual concern, when they share the same behaviour norms, when they dislike interruptions and sudden changes, and the like. Such a group must satisfy some personal needs, such as needs for affiliation, acceptance, recognition, and security of its individual members.

Deutsch (1960) was supported by other investigators as well when he concluded that a situation of cooperative relationships was more attractive than one in which members were competing. Cohesiveness could be destroyed in a class group if the group was split into competing sub-groups.

Various research studies indicating devices for increasing cohesiveness have implications for teachers who wish to develop unified groups in classrooms. Bany and Johnson (1965, pp. 72-73) mentioned the following means found useful to develop cohesiveness.

1. Hightening the pupils' awareness of the various attractions the class group offers.
2. Stressing satisfactions that are to be derived from working with other members of the class.
3. Telling the group as a whole what a good group it is when warranted.
4. Emphasizing the group prestige when suitable.
5. Dramatizing the many new and interesting things they will learn, and beginning with an attractive activity on which the children can work together.
6. Having the group plan together some phases of their daily activities.
7. Getting favourable evaluation of the classroom group from an outsider when appropriate. (Administrator, supervisor, another teacher, etc.).

Communication

The behaviour of a group is determined to a large extent by the pattern of communication or interaction. Frequent interaction, absence of authority, and awareness of success leads to interaction accompanied by friendliness among members of a group as suggested by Homans (1950).

Leavitt and Mueller (1951) found that one-way communication reduced the accuracy of the communication and increased strong hostility towards the sender of the information. An initial period with feedback improved accuracy and, if continuous, resulted in friendliness with the teacher. Thibaut and Coules (1952) revealed that mutual understanding was difficult to achieve when communication was not direct and was severly restricted.

The force to communicate decreases when there is uniformity and where there is an unwanted (stranger) person in the group as revealed by the investigation conducted by Festinger (1950).

McNeil (1962) concluded on the basis of his study that student teaching would improve if feedback included (1) indication of the extent to which children understood the lesson (knowledge of the rate of progress), (2) knowledge of the obstacle encountered by children, and (3) explanation of how teaching performance could be modified.

A study by Jenkins (1948) indicated that more interest and enjoyment was achieved when a group leader (teacher) tried to insure equal participation for all members and when he participated in discussions by injecting comments, and questions.

The communication level varies positively with the degree of group cohesiveness (Lett and Lott, 1961). Kelley (1951) observed that a person with an unfavourable position in the group either limited his participation in the affairs of the group or communicated irrelevant content while high status persons did not behave in that manner. Hare (1952) concluded that a group to function effectively should normally have 12 members and that leaders in smaller groups tended to have more influence on group decisions than did leaders of large groups. Hamphill (1950) indicated that the larger the class size, the more directive and dominant a teacher must be. Stienzer (1950) concluded that the interaction increased when the persons in groups could see as well as hear other members in the group and when expressive individuals were seated quite opposite to each other.

Levitt (1951) found that centrality (most central position) increased the person's satisfaction; that where it was evenly distributed without a leader there was high activity and satisfaction with the group;

that those lacking relative centrality were usually followers; that in small groups the circle was the most satisfying pattern and the wheel pattern (leader at the centre of the circle) as the least satisfying.

Observations reveal that in a free choice of position, pupils tend to move towards the leader and form a tight compact group. For individual tasks the best seating arrangement is one that limits communication and social access. Permanent seating by ability causes anxiety and frustration and hinders learning. Communication between pupil and pupil is important in establishing a cooperative, friendly class group. A child who continually seeks approval from the teacher is usually anxious and fearful. If problems in a group are to be prevented or solved satisfactorily and if the change in group behaviour is to be achieved, the lines of communication in the classroom must be open but should not ignore the desirable controls and restrictions.

Structure

The nature of the structure or the positons that individuals occupy in the group structure also affects their individual responses, actions, and behaviour. Status is affected by such factors as uniforms, sex, personal and social qualities and abilities that contribute to aspects of the group's purpose (Cartwright and Zander, 1960). Methods employed in grouping or structuring pupils usually place varying emphasis on type of curriculum, text scores, IQs, homogeneity and reading adjustment.

Research by Kelley (1951) and many others indicated that status structure that provided little opportunity for upward locomotion caused hostile feelings in individuals and dislike for the group; and high status with security of position and low status with possibility of upward locomotion both operated to develop inter-level friendliness. According to Johnson's (1947) findings, members in high group make friendship choices among other high group members. Sherif (1956) observed that those members of a group who anticipated low ratings for themselves tended to over-estimate the sociometric status of others; those with the high self-expectations under-estimated the status of others.

It seems safe to assume that rigid practice of structuring classes according to ability seriously affects children's attitudes towards themselves, towards others, towards learning, and towards school, as observed by Bany and Johnson (1965, p. 92).

Norms

Every society, large and small, does have some basic values such as are established in manners, conventions, mores, law, customs, traditions, codes, values, standards, rules, fads, and fashions. Norms represent not the behaviour itself but what people in groups think behaviour ought to be or what they expect it to be. These should be expected, at least to some extent, by members (not essentially the majority) of the group. But behavioural guides established by the teacher with the class group do not serve as a means for changing or improving the behaviour of the class group, as indicated by Kelley and Thibaut (1959).

Jackson (1960) suggested that the classroom atmosphere could be very threatening unless children are accorded approval and reward for behaviour considered appropriate or ideal in the same or with the same intensity as disapproval and punishment for behaviour regarded as inappropriate.

Crutchfield (1955) found as a result of his investigation that about one-third of the responses made by a group of individuals were strongly influenced by the majority of opinions, even when that majority opinion was clearly false.

Beranda (1950) revealed that children were more influenced in their judgements by the alleged opinions of other children than they were by the opinion of teachers.

The work of Sheriff clearly indicates that norms are set up in the course of interaction and that children in class groups behave in similar fashions, because as individuals they are similar in many respects such as ways of perceiving, grades, age, having no firm conviction, interests, needs, and desire to be accepted by their age-mates.

It has also been observed that norms may be imported from other relationships, may form in a process of trial and error, may emerge accidentally, and may become standardized as children play and work together.

Conformity to the class group norms may be induced by rewards, approval, and commendation. Bovard (1948) was supported by other investigators as well when he provided evidence that groups in which members could freely interact without fear of ridicule or scorn produced a high conformity to group norms. Often, the group produced behavioural conformity by means of the threat of punishment or non-acceptance, disapproval, withdrawal of rewards, ridicule or scornful remarks, and expulsion.

French and Raven (1959) attempted to identify and define five major types of power to explain how pressure was exerted upon individuals to make them conform. Those five types of power were: (1) reward power, (2) coercive power, (3) legitimate power, (4) referent power, and (5) expert power.

Findings reported by Festinger and Thibaut (1951) showed that when the group norm conflicted with a firmly established set of values, individuals in the group were not apt to conform to the group norms or to change their behaviour to any great degree.

Back (1951) observed that a strongly cohesive classroom group produced more conformity to norms than one that was low in cohesiveness. If a group was engaged in important or attractive activities, indivduals tended to yield to group pressure, are revealed by Cartwright and Zander (1960).

Sheriff (1956) was supported by other investigators too when he observed that there was a tendency to conform to the norms when the individuals desired status or popularity within a group, when the individuals had weak opinions, and when there was the expectation of rewards to follow. Stack (1958) and his co-workers found that deviation occurred when an attempt was made to make sudden changes in the regular practice, when new norms were set without consulting the group, and when there was a lack of effective communication with other members of the group. But a well accepted valued deviator member was rarely rejected or punishedby the group; insead the group even changed the norm in his favour or chose some other alternative.

It was found by Kelly (1954) and his co-worker that a child deviated from the group norms when these demanded some ability that the individual did not posses, when he was made to feel that he was not likely to be valued, and when the following of his goals was more rewarding. Constant deviation by a child may result in adverse attitude towards the school and the school work, lack of the sense of security, a feeling of failure, inefficiency, tensions, loss of acceptance, and a classroom condition not conducivev to learning. The teacher needs to support him and his stand and at the same time to get the group to reduce its demands.

Goals

Newcomb (1950) defined goal as 'a state of affairs towards which behaviour is directed'. It refers to objects, consequences or expectations that either a person or a group of persons seeks to achieve. Goals as found in classroom groups serve to motivate, energize, mobilize and change the behaviour. They may be individual, group, a combination of the two; long-range or remote; sub-goals or intermediate goals; operational; non-operational; task; non-task; and of mulitiple nature. They may vary in force, degree of strength or dominance.

Anderson and Braudt (1939) and many other investigators agreed that acceptance of goals could be achieved by making of arrangements by the class, class willingness to enact certain behaviours, awareness of the knowledge of the rate of progress, group discussion, maximum participation of members, cohesiveness in group, cooperation, clear understanding of the goal, and making task goals a matter of group planning and decision.

Members who participated actively, talkative group members, individuals with high social acceptability, and ability to express ideas clearly and with enthusiasm were more likely to succeed in getting their groups to select their solutions to problems as revealed by Willerman's (1953) study.

There are three major factors that influence the group behaviour in the classroom and they are: (1) Group composition, (2) Instructional leadership, and (3) Frustration.

Group Composition

Certain characteristics of an individual member affect the total group pattern of behaviour and also determine, to a great degree, his status in the group, the extent to which others accept him. The social acceptance of a member depends upon his physical characteristics, experience, atttiudes, values, habits, basic motives, the process of perceiving and interpreting the situation in which he finds himself, liking for others, ability to make suggestions about activities, similarity with other members, and the like.

Children who differ in appearance, cultural backgrounds, race, religion, nationality, language, economic status, or who differ in other ways may not be accepted by the class group. But teachers' attitudes, preconceptions, and reactions to children may have strong influence on whether a class group accepts or rejects individuals who are different.

Investigations by Tyler, Smith, Bany, and others reveal that personality traits that are admired by the member of the class group vary from grade to grade.

Instructional Leadership

The acts of teaching are leadership acts. The following requirements, prescribed by Bany and Johnson (1965, pp. 197-211) after examining a number of investigations on the subject of the leadership act, specify certain generalized functions of leaders and are applicable to the teacher's leadership role in the class group:

1. A leader formulates plans and policies consonant with the objectives and purposes of the group.
2. A leader analyzes, organizes, and helps the group carry out decisions and plans.
3. A leader creates and maintains group morale and solidarity.
4. A leader provides information and facilitates communication in the group.
5. A leader keeps individual purposes and activities in harmony with the group's purposes and goals.
6. A leader adheres to a consistent set of principles regarding expressions of approval and disapproval.

An examination of a number of studies regarding instructional leadership reveals the following points:

1. Participatory leadership has surpassed other methods in terms of the total effect upon the group (Cattell).
2. Group-centred pattern of leadership creates on atmosphere or climate most conducive to learning (Flanders).
3. The dimensions of teacher leadership are: leading, considera-

tion, integration, organization, motivation, achievement and social awareness (Bany and Johnson).

4. Teachers using dominative practices in teaching procedures receive non-cooperation and conflicting responses from their pupils. (Anderson and his collaborators).
5. Roughness, threatening and severe criticism by a teacher produces a negative atmosphere (Ostlund).
6. Group influences are greater than teacher influences (Goldberg).
7. Children should be made to compete in a situation in which everyone should receive a prize or no one receives one in order to increase their positive behaviour (Standler).
8. The best work is achieved by a teacher who is warm, friendly, seeks pupils' support in classroom decisions, and uses group integrating techniques (Cogan).
9. Group planning and committee work and the use of group decision to set goals was a highly productive method of teaching in the area of social studies (Dawson),
10. A teacher who persuades a class to shift opinions by using a 'divide and conquer' technique, that is, talking to certain students and ignoring the rest, is apt to be successful. (Flanders and Havumaki).
11. Teachers who were friendly, understanding, responsible, systematic, business-like and self-controlling had more influence on children than those teachers who were egocentric, aloof, restricted, unplanned, and evading (Ryans).
12. There is a prevalent belief that democratic teaching is a process of leading rather than directing.
13. The general research on leadership seems to indicate that one pattern of performance is not effective in all types of situations and with all kinds of groups.
14. It may be concluded that the teacher should know what effect each teaching behaviour has so that he may then modify his behaviour to most efficiently achieve his purposes (Modley and Mitzel).

Frustration

Frustration is another factor that influences group behaviour in the classroom. It may be expressed by a group in a variety of ways like passiveness, quietness, non-responsiveness, being disinterested, withdrawal, becoming dependent, attacking directly, rejecting or changing the task, and becoming disorganized and disintegrated. Too much of authority and restricted channels of communication force the group to displace its hostility.

A group becomes frustrated when needs are blocked, withheld or thwarted. Sources of class group frustration may be: group conflicts, inability to achieve desired goals, deficient environment, unexpected change, unsuitable assignments, group goals, ambiguous situation, and boredom with routine. With age and experience, previously frustrating conditions come to be accepted. The rebel is aggressive and is approved by a frustrated group having some underlying cause for its resentment while a contented group will strongly disapprove his behaviour. The rebel always has a problem and his behaviour is a mere attention-getting device which may also be disliked by a frustrated group.

Techniques for Changing Group Behaviour

Major techniques such as the following have been devised by educators to change the group behaviour: (1) Group-decision techniques, (2) Problem-solving methods, and (3) Techniques for studying groups.

An impressive amount of evidence is available to support the idea that a greater change in behaviour is produced when members of a group are permitted to participate (total participation) in decision making than when a decision is imposed upon the group by a leader.

Experiments devised by Kurt Lewin (1958) and his co-workers reveal that it is usually easier to change the behaviour of individuals by changing the group standard or norm than by changing each individual one by one and that discussion plus a group decision were the most effective techniques.

Group problems should normally be viewed as the group's way of overcoming certain problems. Group problems do have an adverse effect upon the learning individual members. It is, therefore, necessary to solve or minimize group problems. Studies seem to indicate that tension in groups is eased by a group analysis of the troublesome situation. The process of group problem-solving is a method of analyzing a situation, defining the problem, finding solutions, accepting a solution, and agreeing upon a plan of action.

Decision by vote should be discouraged and the group should be persuaded to agree at least on a trial plan. A teacher who involves the group in planning and solution rarely has a group that reacts with hostility.

To understand children's group behaviour—in order to change it —various techniques such as the following are used by educational investigators: (1) Observation, (2) Sociometric techniques, (3) Questionnaires, (4) Cumulative records, (5) Anecdotal records, (6) Time sampling, (7) Group biography, and (8) Guide to group characteristics.

The above-mentioned techniques should be used to find characteristics like cohesiveness, structure, communication, norms, goals, group composition and leadership practices.

To gain most from this paper teachers need to give it honest thinking and they should attempt to make for themselves some studies of their own classroom groups after gaining the knowledge needed to conduct experiments from the sources available. It is, however, hoped that their increased understanding of the classroom group behaviour will increase the likelihood that they would be more able to make life better, both now and in the future, for the children in their classes, and obtain for themselves a greater personal satisfaction from the hours they spend teaching.

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Training in Computer Programming

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This paper highlights the important features of the course in programming at the Government of India Computer Centre, New Delhi, such as the syllabus, methods of teaching, the place of quizzes and tests in training and practical computer operations. The utility of a constant dialogue in effecting improvements in educational standards is also brought out.

Electronic computer is a recent innovation in India. There are at present about 120 computers in the country including those installed at government offices. The need for streamlining the data processing systems of the government with electronic computers has long been felt. Some isolated efforts have been made in this direction by individual organisations acquiring small computers. A significant measure to tackle this problem in a coordinated manner was taken only recently when a common computer facility was established in the Department of Statistics in November 1967.

It has been recognised from the beginning that a computer installation is only as good as the personnel running it. Without a strong base of efficient technicians, an electronic computer installation would only be a useless status symbol. Right from its inception, therefore, the Computer Centre in the Department of Statistics devoted considerable time and effort in organising training courses for various categories of technicians.

Computer education requires organisation at various levels aiming at the requirements of different categories of personnel such as:

1. Electronic computer appreciation courses for senior officers at the managerial and policy-making level.
2. Short courses on machine-independent automatic programming languages like FORTRAN, COBOL, ALCOL, etc.
3. Intensive courses on programming and operation of specific computer systems.
4. Advance courses on systems analysis and design, sophisticated computer applications, etc.
5. Intensive courses for maintenance engineers, on a specific hardware.

The Computer Centre has conducted a number of courses for categories 1, 2, 3, and 5 above and is presently planning courses belonging to category 4. The present paper, however, gives in some detail the content and method of teaching of the intensive programming courses referred to at 3 above, and narrates the experience of conducting the programming courses at the Computer Centre during the last three years. Courses run on the lines followed by the Centre, it is felt, would be extremely useful in imparting the right type of education in basic programming.

Training Courses for Programmers

The training for Programmers consists of five principal subjects: (1) Fundamentals of EDP; (2) EASY (the Assembly language of Honeywell-400); (3) COBOL/AUTOMATH (a variant of FORTRAN II); (4) H-400 Operations; and (5) Systems Analysis and Design. Concurrent courses were run in COBOL and AUTOMATH. In these courses the emphasis was on the detailed knowledge of one symbolic language (EASY), one compiler language (COBOL/AUTOMATH), machine operations and systems design. The duration of these courses was 17 weeks divided as follows: Fundamentals of EDP—one week, EASY—five weeks, COBOL/AUTOMATH—five weeks, H-400 Computer Operations—three weeks, Systems Design and Analysis—three weeks.

The trainees were expected to attain a high level of efficiency in each of the above subjects and were expected to do systems analysis on their own as well as operate the computer. In short, they were expected to be all-rounders.

Selection of Instructors

The first course was conducted entirely by Honeywell experts. During the course talented candidates were watched through the method of class presentations, and a few were finally selected as instructors to run the second and subsequent courses. The second course was conducted partly by Indian instructors selected from the first batch and partly by the Honeywell experts. The third was conducted entirely by Indian instructors. A batch of three instructors used to run the entire course. Once the necessary talent for conducting the courses was found, the subsequent courses were organised rapidly without putting strain on the same instructors. Changing of instructors also facilitated improvements and adjustments in the course outline.

Programming Difficulties

By the time the third course was over, the first and second batch students had started writing programmes and testing them on the computer. In the initial stages, the students experienced innumerable difficulties and a lot of consultation and discussion with the Honeywell experts was required. The difficulties were mainly in the diagnostics which crop up in the process of actual execution of programmes. These experiences were collected, analysed and suitable modifications in the emphasis of the topics to be taught were made in the subsequent courses. The in-house instructors, who had started writing programmes on live projects, collected a large number of new examples. These experiences were suitably incorporated in the teaching. Thus, the subsequent courses became more oriented towards live problems and projects. The problems given for programme writing were changed every time and were tested on actual data during the operations course. Writing programmes for a live problem and testing them on live data give a special satisfaction and confidence to a trainee programmer.

Operations Experience

During these courses, the operations part of the training came after fundamentals, EASY and COBOL courses. It was observed that students found it difficult to grasp certain concepts which were machine-based since they had not operated on the computer. Therefore, a change was made in the training programme and during the fundamentals part of the course itself, on the second or third day, students are taken to the computer room and shown all the peripheral devices. Again, the operations part of the training is broken up into two parts. As soon as the EASY course is over, students are given operations training on computers for a week. Their EASY programmes are assembled and executed. They are also trained in other console operations including initiation into the use of utility routines and systems programmes like Tape Handling Routines (THOR), SORT, Library Maintenance and Programme Selection Routines (LAMP-PSP) and other systems programmes A batch of four students is allotted one and a half hours of computer time everyday. The students go in batches and assemble their programmes and execute the same. They also mount the tapes and dismount them, put the paper in the printer, run the card reader and manipulate the system through console operations. Then the students come to the COBOL course. After completing the COBOL course, students again go to the operations and compile and test their COBOL programmes. They also execute other COBOL systems programmes and routines such as Programme Tape Maintenance (PTM), rerun, etc.

Pattern of the Present Courses

On the basis of the experience of the first three batches the emphasis and content of the courses, were also modfiied. Three main changes were introduced. First, the operations course, as already mentioned, was reduced by one week and was divided into two sessions —one immediately after the EASY and the other after completing the compiler language. Second, the EASY course was reduced to three weeks instead of five weeks. It was found that the demand of the trainees and offices was mainly for using the compiler languages and not for the assembly language. The coverage of EASY was, therefore, kept to the absolute minimum level, but the contents were such that if one desires to write Programmes in EASY, one should be able to do so. Thirdly, Systems Analysis course was condensed to the theoretical part of the subject and the actual project work was dropped. This change was introduced because the main purpose was not to train systems analysts but Programmers. Most of the trainees were going to be employed mainly as Programmers and orientation towards the essential basic principles of systems analysis was considered adequate in a basic course on programming. Now, the course is of three months' duration as follows:

1. Fundamentals of EDP (one week)
2. EASY (the Assembly language of H-400) (three weeks)
3. Operations (one week)
4. COBOL/AUTOMATH (a variant of FORTRAN II) (five weeks)
5. COBOL/AUTOMATH Operations (one week)
6. Systems Analysis (one week).

Contents of the Various Subjects

Fundamentals of EDP. During fundamentals, students are taught the basic concepts and elements of data processing, history of computers, numbering systems, input/output peripherals and devices, central processor, characteristics of hardware and software available at the Centre. The trainees are also explained the punching and verification operations and are supplied with Hollerith code lists so that they can decipher the holes punched on the cards.

EASY. During the EASY course, students are explained the basic instructions and their manipulations. They are given one or two problems for which they are required to write full programmes and these are tested on the computer during the operations course

COBOL. In the COBOL course, four such problems are given and are compiled and tested on the computer to the extent possible The basic concepts of the language and its verbs are taught during the first ten days and students write the programme for a simple problem during this period. Cards are punched and the programme compiled The students get an idea of various difficulties of de-bugging and mistakes in source programme listing.

AUTOMATH. The topics covered include various types of statements such as arithmetic, control input/output, etc., expressions and functions, programme partitioning, AUTOMATH compiler maintenance.

error analysis in numerical calculations and operating procedures. During the course students write four programmes, compile and execute them.

Operations. In the Operations course, the first thing is to execute programme on the test data. This gives the students an opportunity to test their logic. In many cases, the logic does not work and the students have to revise their programmes. The revised programmes are then compiled and tested and necessary input/output documents given to the students for studying the results of the programme.

The actual operation of the computer and its peripheral devices is an interesting aspect of the training. Some people think that a Programmer need not know the actual computer operations and, in many foreign countries, Programmers are not even allowed to enter the computer room but it has been observed during these courses that until and unless the Programmer actually sees the process of compilation and execution of his programmes on test data and knows the reactions of the computer to various statements he has written, he will face the difficulties in writing good programmes, e.g., how segmentation can slow down the operations or what happens when card read error or editing error is encountered. The more the knowledge of the machine and the environment in which it operates, the more efficient his programmes become and he is in a position to produce better results. During the operations course, students are also trained in setting up the various peripheral devices, mounting and dismounting the tapes and console operations. Trainees are given demonstrations in various software routines like SORT and THOR programmes which are frequently required in any job.

Systems Analysis and Design. During the systems trainings, students have to learn the basic principles of systems analysis and systems design. They are also initiated into the management tools such as PERT, Linear Programming, etc., and are explained how to use the computer software packages already available at the Computer Centre. The techniques of form design, card design, tape layouts and printer outputs are explained. Run developments form an important part of the syllabus. This creates confidence in the students to undertake systems analysis of the jobs when they go back to their respective organisations.

Selection of Trainees and Aptitude Tests

For admission of trainees to the course, the government organisations with potential computer applications are requested to nominate candidates for the Programmers' training course. One of the conditions laid down is that the organisation must have a definite plan for using an electronic computer for information processing. Only those officers who have been assigned to work on EDP projects in these organisations are selected for training. An aptitude test is given to all nominees. The test is designed to assess the numerical ability, verbal reasoning, logical thinking and mathematical faculties of the candidate. Candidates are generally admitted to the course on the basis of these tests. The performance of trainees in the training course is found to be highly correlated with their performance in the aptitude tests. About 30 candidates are admitted in each course.

Course Timings

Classes are held from 8.30 a.m. to 2.00 p.m. on all working days. This enables the trainees to have a continuous stretch of five to six hours for their homework and study after lunch and rest.

Method of Teaching and Instructor Guides

An important aspect of the training is that the syllabus stresses the contents of each day's teaching and time is allotted for each and every topic to be taught in the class. Teaching materials, called instructors' guides, specify in detail the points to be emphasised in the class, examples to be solved on the blackboard, home assignments for students and their model answers. Manuals and other cyclostyled material are distributed to the students which remain their property. Teaching aids such as charts and slides are used for effective teaching. Intelligent questions are encouraged at the end of each topic and this question-answer session helps in clearing the doubts of the students. At the end of the day, the instructor briefly reviews what has been covered during the day, distributes home assignments to students. Next day, the first thing the instructor does is to review briefly the topics taught the previous day, collect the home assignments and then proceed with that day's lesson. The home assignments are examined in spare time and discussed in the class the following day.

Tests and Quizzes

In order to assess the impact of the teaching on the students, tests and quizzes are given repeatedly. Every week, one quiz lasting for about 45 minutes to an hour and a test for about 2½ hours are given. Answers to the tests and quizzes are evaluated immediately and the answer papers returned to the students on the next day when these papers are discussed in the class by the instructor. The exercise of quizzes and tests, though initially disliked by students, have many advantages. First, this gives an idea to the instructor as to how far his instructions have been understood by the students and whether any improvements are needed in his teaching approach. Secondly, the students benefit by the review and discussion of the topics learnt by them during the past week. In fact, the tests and quizzes are the backbone of the Programming courses. The quizzes are 'closed book' whereas tests are sometimes 'open book' and sometimes 'closed book', depending on the complexity of the topics. A final examination is given at the end of the subject. The passing standard is kept high at 70 per cent of marks; 80-90 per cent is classified as B grade and above 90 per cent as A grade. Due weight is given to the performance of the student in the final examination and the weekly tests and quizzes.

Intensive Teaching

A topic is taught in the class with appropriate examples solved on the board. Home assignment is given on the same topic, which is reviewed next day in the class. The following day a quiz or test is given on the topics taught during the last two days and these tests and quizzes are reviewed on the following day. Thus, a topic is actually discussed four or five times in a week.

The courses are so intensive that during the period of training, students are unable to do anything else except the work assigned by the instructors. In many cases, they have to get away from their social and family life. But, once the course is over and the students have time to look back they find that they have learnt a lot, gained a new kind of confidence and are in a position to undertake analysis of jobs and write successful programmes.

Instructors

The number of instructors varies from subject to subject. There are separate instructors for fundamentals, EASY, COBOL, AUTOMATH and systems analysis. There are two instructors for fundamentals and systems analysis whereas for other subjects, there are three. Instructors are changed and during off-season, they are given live subjects to develop computer systems and write programmes. Actual experience of writing programmes, therefore, adds to the effective organisation of training courses. A large number of examples based on actual jobs done on the computer are utilised in the training courses. Workbooks based on such examples have been prepared and are distributed to the students. These are continuously being revised on the basis of new experience gained.

Instructor-Trainee Rapport

The Programmers trained at the Computer Centre go back to their organisations and write programmes for their jobs. They come to the Computer Centre for compilation and testing of their programmes and consult their instructors in cases of difficulties. They are helped in solving their problems. This gives an opportunity for the instructors to be in constant touch with their students. The continuous dialogue with former students helps the instructors in knowing the practical requirements of the users. On the basis of these experiences and in consultation with some of the users, the homework assignments are revised in such a manner as to give adequate knowledge of actual situations which the Programmers are likely to face when developing the computer systems and programmes.

Conclusion

The test of any Programming course is to find to what extent the Programmers gain confidence in writing programmes and in producing results. It has been our experience that Programmers trained at the Centre have enough confidence and knowledge to take up difficult assignments and successfully produce results in a short time. The fact that 40-50 organisations have been effectively using the Centre's facilities and currently buy 700-800 hours of computer time every month for their use is adequate testimony of the fast progress made by the Programmers trained at the Centre. The training courses at the Centre have built up a high tempo in computer utilisation and have created awareness at various levels among management and technical personnel.

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Teacher Behaviour Patterns in Teaching Different Materials

Biswanath Roy

The author reports an investigation undertaken to analyse differences in teacher behaviour while teaching different materials, namely, general science, social studies, mathematics, the languages. Sex is another variable studied. The subjects were 32 male and 11 female middle school teachers. The findings reveal that teaching materials as well as sex play a definite role in creating variations in teacher behaviour.

Whatever may be the effort to change the school practices, ultimately it comes down to the teachers' classroom behaviours, his teaching and the teacher-student interaction. Examination reform, better housing and sitting facilties, supply of free textbooks, etc., have their own merits but ultimately it depends upon the teacher and his teaching to bring both quantitative and qualitative improvements in the field of education. It has been widely felt by several thinkers that, changing older patterns of teacher behaviour is an immediate necessity to meet and cope with the planned developments of various countries and the immediate social changes which also have come up. It involves moment by moment analysis of the teaching-learning effects. Ineffective teaching produces interaction failures leading to very little teaching-learning effects.

Paper read at the Second National Seminar on Classroom Interaction Analysis and Teacher Behaviour held at the Centre of Advanced Studies in Education, M. S. University of Baroda, from 16 to 20 January 1971

The present investigation intended to analyse the teachers' classroom behaviours while teaching different materials which were general science, the languages, mathematics and social studies. The propositions were:

1. That there may be some noticeable differences in teacher behaviour while teaching different materials.
2. Sex may have a role to play in teacher behaviour.

PROCEDURE

Subjects

Altogether 43 teachers (32 male and 11 female) were chosen from seventeen middle schools. The teaching materials and the teachers were as shown in Table 1.

TABLE 1

Distribution of Teachers as per Teaching Materials

Languages	*Ganeral Science*	*Social Studies*	*Mathematics*
19	7	12	5

N=43

The number of teachers were as per ready availability.

Method

Flander's classroom interaction schedule[1] was used to meet the purpose. It required the following completed formalities.

Practising for inter-rater reliability. As it is a basic requirement for using the Flander's system the set of observers made practice observations in local schools as below:

1. A period of 20 minutes was observed totalling 400 observations (one observation in every three seconds) during one school period.
2. The observation sheet provided some space for noting special observations, if any.

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[1] Flanders, Ned. A. *Interaction Analysis in the Classroom—A Manual for Observers*, Univ. of Minnesota, College of Education, Aug. 1966.

3. The interactions during the first and the last ten minutes of the 40 minutes' period were not considered to avoid the beginning and finishing effects in teaching.
4. Since the observers had sufficient experience of the school procedures, memorizing and learning the concepts of the ten categories took two days and the practice work continued for about three weeks more.

Readiness for the final experiments. (1) The observer training was carried out under the declared variations in the teaching material contents. (2) After attaining sufficiently high degree of reliability between the observers, the final experiments were taken up under shared responsibilities.

The teachers were primarily told that this experiment bore no regular relationship with their professional environments but was to test the extensiveness of a research method only. Therefore, they could ignore the presence of the observers in the classroom and go on taking the class in the usual fashion.

RESULTS

The inter-rater reliability is shown in Table 2. The reliability measures were obtained by finding out the Scott's Coefficient or 'p'. The formula (using per cent) was:

$$\pi=\frac{Po-Pe}{100Pe-}$$

Where, Po is the proportion of agreement
Pe is the proportion of chance expectation for agreement.

TABLE 2

Inter-rater Reliability by Scott's Method (Using Per Cent)

	Observer B	*Observer C*
Observer A	.83	.71
Observer B		.79
Average	.78	

The teacher-pupil interactions are studied for 20 minutes leading to 400 observations per teacher. Assuming the null hypothesis that teaching materials had no effects on the teachers' behaviour, the Mann-Whitney U-test was applied separately to each combination of groups. Teaching-material-wise combined frequencies are given in Table 3.

TABLE 3

Teaching-material-wise Distribution of Combined Frequencies

Teaching Materials	*Number of Teachers*				*Categories*						
		1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Languages*	19	5	141	75	782	2916	426	175	1997	263	920
Social Studies	12	1	80	63	347	3035	93	42	657	88	394
General Science	7	1	26	15	184	1857	57	55	288	110	207
Mathematics	5	7	72	51	299	574	31	10	575	101	280
Total	43	14	319	204	1612	8382	607	282	3417	562	1801

*Includes English, Hindi and Sanskrit.

The inter-group U-values are shown in Table 4.

TABLE 4

The Inter-Group U-Values

	Social Studies	*General Science*	*Mathematics*
Languages	40	41	48
Social Studies		48	41
General Science			43

All the inter-group U-values shown in Table 4 were significant at

.05 level. These showed that there are changes in the teachers' behaviour teaching different materials. This establishes the first proposition.

Further, assuming the null hypothesis that the sex has no effect on the teachers' behaviour U-test was applied. The mean frequencies and the U-value have been shown in Table 5.

TABLE 5

Sex-wise Mean Frequencies (Approx.) and U-Values

Teachers	*Categories*										*U.-Value*
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	
Male	.4	4.7	7.0	7.5	13.6	16.5	36.9	45.7	66.6	201.0	45
Rank 1	2	3	6	9	11	12	14	16	17	20	
Female	0	4.9	5.3	7.1	7.3	11.5	30.8	39.4	116.8	117.0	
Rank 2	1	4	5	7	8	10	13	15	18	19	

The U-value was significant at .05 level which shows that the sex has also a role in the teacher's behaviour. This establishes the second proposition.

Percentage of Time Spent on Lecturing

Table 6 indicates the percentage of the time spent on lecturing (category 5) in relation to the total interaction in the class.

TABLE 6

Percentage of Time Spent on Lecturing

Teaching Material	*Number of Teachers*	*Percentage Time*
1. Languages	19	38.4
2. Social Studies	12	63.2
3. General Science	7	66.3
4. Mathematics	5	28.7

The above results indicate that teachers of general science and social studies spend higher percentage of time in lecturing (66.3 per cent and 63.2 per cent). Teachers of mathematics and languages spend less time in lecturing (28.7 per cent and 38.4 per cent).

Indirect and Direct Influence in the Classroom

The first four categories are for indirect influence and the next three categories are for direct influence. The ratio of these two types of influences is known as I/D ratio. If the two influences are balanced or equal, I/D ratio would be 1. If the teacher uses indirect method, then the I/D ratio would be more than 1, and if the teacher uses direct method, I/D ratio would be less than 1. Table 7 shows the results.

TABLE 7

Distribution of Teachers on I/D Ratio

I/D	*Number of Teachers*	*% of Teachers*
More than 1	2	4.6
0.6 -0.9	3	7.0
5 and below	38	88.4

The majority of the teachers (38) have shown direct influence in opposition to only those five cases who were either middle of the way or used indirect influence.

The I/D ratios shown in Table 8 indicate the influence pattern teaching-material-wise.

The figures indicate that on the whole teachers of general science and social studies were more direct (11 and 15) than the teachers of mathematics who were comparatively less direct (.70).

TABLE 8

Teaching-material-wise Distribution of the I/D

Teaching Materials	*N*	*I/D Ratio*
1. Languages	19	.28
2. Social Studies	12	.15
3. General Science	7	.11
4. Mathematics	5	.70

Verbal Interactions of the Teachers and Students

Flander's system provides the teacher and student participation in classroom interaction in 2:1 ratio. The total number of observations made in categories 1 to 7 divided by student talk (categories 8 and 9) gives the TS ratio. It is shown in Table 9.

TABLE 9

The Teacher-Student Ratio

	Teaching Materials	*Number of Teachers*	*TS Ratio*
1.	Languages	19	2.1
2.	Social Studies	12	4.9
3.	General Science	7	5.5
4.	Mathematics	5	1.5

Results in Table 9 indicate that students were less active in general science and social studies classes and more active in mathematics and the language classes.

CONCLUSION

The obtained results have established both the propositions. In continuation to the first, it may be analogized that the teaching materials themselves were the sources for such variations in the teacher behaviour. Further, sex also proved to be another source of such variations. Therefore, it can be inferred that male teachers may teach general science and social studies better than female teachers, who may teach mathematics and the languages better than the male teachers.

In the second part it has appeared that there is a division between the teaching materials, general science and social studies on one hand and the languages and mathematics on the other hand as regards the additional three observations. High lecturing, direct influence and lesser student participation were predominant features with the former pair of teaching materials. It was also revealed in Table 7 that most of the teachers were using direct influence in the classroom. No figures were collected as regards the academic achievements of the pupils under such influences to determine the productivity issue or whether any of the teachers were trained or not. But if the question of the climate of the classroom is of any concern then steps for democratization of the authoritarian teacher behaviour are necessary. The feedback system can be a method for such a purpose.

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BOOK REVIEWS

Educational Testing

Developments in Educational Testing, Vol. II

Karlheinz Ingenkamp (Ed.), University of London
Press, Ltd., London, 1969 (pp. 502).

Since problems confronting educationists in the area of testing are similar everywhere, it is of use to evaluators to know about how their contemporaries in other parts of the world have attempted to approach and solve them. The first International Conference on Educational Measurement, held at the Kongreshalle in Berlin from 16 to 25 May 1967, provided an excellent opportunity to psychologists and experts in measurement and evaluation from various countries to exchange views on the subject through discussions and presentation of papers.

The publication is a compilation of 41 of the 79 papers presented at the conference. The other 38 papers have been published in the first volume. Both the volumes have been very ably edited by Karlheinz Ingenkamp of the Padagogisches Zentrum, Berlin, under the title *Developments in Educational Testing* and published by the University of London Press, London. The editor has exhibited great ingenuity in very carefully classifying the papers among the two volumes and within each. This also accounts for the near independence of the two volumes in view of the themes they present. The very fact that the participants of the seminar, and thereby the contributors to the book, are people of eminence in the field of testing from different parts of the world is by itself a testimony of its quality and value.

Content Overview

Tests for different stages of education are the main subject of Volume II. Papers included in this volume have been classified as:

(a) Tests for the primary school
(b) Tests for secondary school
(c) Tests for the university.

While papers on the first two stages of education (five in the first and ten in the second) have not been further classified, papers related to the university stage stand divided into seven sub-heads: (1) selection tests for universities, (2) the influence of tests on the learning process, (3) teachers and testing techniques, (4) interpretation and use of test results by teachers, (5) use of test results for the improvement of instruction, (6) validity and norms of tests, and (7) testing and curriculum research.

In a review of a publication with such a large variety of themes, it is neither possible nor desirable to summarize all of them. An attempt is therefore made below to highlight some salient contents of the book.

Testing in Primary Schools

This section covers school readiness tests in Austria and West Germany and deals with some of the basic aspects of testing at the primary stage, like the purpose of testing children at this stage, the kind of tests suitable and the use of test results. Some longitudinal studies on the problems of testing at this stage of education have also been described in this section.

Tests for Secondary Schools

The content of this section mainly relates to some studies on the predictability of attainment tests and school marks; the use of tests at this stage for selection purposes in Britain; the validity studies on high school level examinations in Israel, the four-year follow-up study of secondary school selection procedures in Central Africa and the selection tests in use in Mali, Kenya and Pakistan.

Tests at the University

This section incorporates papers on the seven aspects mentioned above.

The first sub-section deals with salient aspects of university selection tests and testing procedures in United States, Canada, Chile, Ethiopia and West Germany. These have a direct relevance for countries where university admissions are almost indiscriminate or without appropriate educational guidance.

The second sub-section which deals with the influence of tests on the learning process contains some very valuable studies. These relate to the motivation of students for study as related to the forms of tests used by the testing programmes—the type of tests and their respective influence on student learning. These bring to the pointed attention of the evaluators some of the facts which they cannot afford to neglect.

Teachers' use of tests and other evaluation techniques forms the core of the next section which brings to the fore the necessity of teacher preparation in the development and use of tests and other devices of evaluation. The sub-section also contains a very interesting comparative study of essay and objective type questions which has been and continues to be a subject of controversy in several educational quarters.

Use of test results by teachers is the theme of the next sub-section. It deals with the help that teachers would need for attempting a better and a more comprehensive use of the test results through appropriate analysis and interpretation. One of the important functions of tests highlighted by this section is the use of test results in improving instruction, a criteria of an effective testing programme which is often overlooked.

The next sub-section in sequence deals with the use of testing in the improvement of existing teaching methods and the development of new ones. It consists of three papers on evaluation and instructional research.

Serially the sixth of the sub-section contains two papers on the problems in establishing test validity and the merits and demerits in the use of different kinds of norms.

The last sub-section deals with testing and curriculum research which is an area of rather recent origin in the educational world. Its inclusion marks the up-to-dateness of the contents of the publication.

Critical Estimate

While other aspects have been given quite a comprehensive coverage, Curriculum Evaluation (Formative and Summative), an area which deserves a discussion in greater detail, has been cursorily dealt with under the sub-head "Testing and Curriculum Research". Even though the book is a compilation of papers presented at a conference, the inclusion of a paper on Curriculum Evaluation, even though it may not have been presented at the conference, is worth being considered for filling in the gap which exists in the subsequent edition of Volume II whenever it may be brought out.

The publication could not be complete without a third volume dealing with the systems of examinations in vogue in various countries at different stages of education. This could be developed through the organisation of a second conference on the subject. The Pedagogisches Zentrum, Berlin, could consider and explore such a possibility. This conference could deal with the systems of external examinations, if any, and the procedures and practices of school/college evaluation in vogue in different countries. Thus, the area of the evaluation of non-scholastic aspects of pupil growth which has remained almost unattended could also be taken care of. Besides, it will provide the readers an insight into the mechanics of examinations within the framework of which the testing programmes detailed in Volumes I and II operate.

Conclusion

In conclusion it could be said that though evaluation procedures and practices should be peculiar to the needs and objectives of an educational system, and the means and methods selected for bringing about the changes do depend upon several factors within the systems, there is much we all can learn, by what has been done elsewhere. Several ideas for such consumption could be found in this compilation. To those working in the field of testing the book has an appeal not easily evoked by every publication on the subject, because of its empirical rather than the usual rational content.

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Child Development in Kauai

The Children of Kauai—A Longitudinal Study from the Parental Period to Age Ten

Emmy E. Werner, Jessie M. Bierman and Fern E. French,
University of Hawaii Press, Honolulu, 1971.

It was around the late 1920s and early 1930s that longitudinal studies of normal child development were started in the U.S.A. They aimed at focussing on the cognitive development and socialization experiences of children. Bloom (1964) and Kagan (1964) have described their methods, goals and findings. Longitudinal studies of events occurring during pregnancy and their associations with childhood disorders, such as mental retardation, cerebral palsy, speech, and reading disorders, perceptual and behavioural problems, are of more recent origin. Most were initiated in the 1950s and 1960s. The investigators differed in their choice of criteria for the selection of their subjects and studied different functions. The Kauai Study is an extension of previous longitudinal research on the relationship between perinatal complications and child development in three major respects: the total child population was studied rather than small selected samples; the observations began as early as the fourth week of gestation; it included the study of both perinatal stress and the quality of the environment and their relative effects on the children's short and long-term development.

The Children of Kauai is a longitudinal study of children from the prenatal period to the age of ten. It presents the results obtained by a multidisciplinary investigation representing maternal and child health, obstetrics, pediatrics, psychology, public health, nursing, sociology and statistics. It studied several thousand families of a multisocial community living on the island of Kauai, Hawaii. The island of Kauai is the northernmost inhabited island in the Hawaiian archipelago. Originally when workers were required on the sugarcane and other plantations, Chinese, Japanese, Portuguese and Filipino labourers were imported to the island. Today it has a rural, multiracial, modern community.

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Beginning in 1954 a team of pediatricians, psychologists and public health workers followed the course of 3000 pregnancies on the island and studied over 100 of the live-born children and their families for a full decade. With data available on the course and outcome of all pregnancies in an entire community comprising all socio-economic ethnic groups in the population, the authors have been able to: (a) give the incidence of fetal and postnatal deaths and perinatal complications; (b) evaluate the relationships between perinatal stress and the physical, cognitive and social development of preschool and early school age children; (c) assess the relative effects of perinatal stress and quality of environment (material well-being, intellectual stimulation, emotional support) on the development of children.

The methodology followed was as follows:

1. The first phase of the study was to take a census of pregnant mothers. Special efforts were made to encourage early reporting of pregnancies.
2. This was conducted simultaneously with the periodic interviews of all women reported to be pregnant, followed by additional interviews during the post-parturition period and when the infant was about one year old.
3. A clinial perinatal rating, based on the presence of conditions thought to have had a possible deleterious effect on the fetus or newborn, was made for each child.
4. Next was a developmental examination conducted around the age of two years which assessed the physical status and searched for the congenital and acquired defects. A psychological examination was also given to a large number of children which consisted of tests of intelligence, social maturity, etc.
5. The next follow-up was at the age of ten years. It took note of the children's school records, hospital records, etc., and collected new information on their school achievement and physical, intellectual and emotional problems. A home interview with the mother was done to get at their previous history. Group tests, and in special cases individual tests of intelligence and personality, were administered to children. These measures elicited information on the types of problems related to school achievement, intelligence, perception, language, emotions, and physical health of children.

The findings of the Kauai Study contribute to a better understanding of the quantitative and qualitative aspects of reproductive causalities and the crucial role played by early environment in influencing child development. The highlights of the study are that it gives a more realistic estimate of the proportion of fatal deaths at various stages of gestation; of the nature and extent of handicapping conditions resulting from damage incurred by the fetus during intra-uterine life and during birth; the development and progress in school of the handicapped children in relation to that of their peers without such handicaps; the influence of the environment on the development in the crucial early years of life; and the impact of the community of the children affected by both perinatal stress and a poor environment during the first decade of life. The study showed that though biological effects were very powerful in the early weeks of the pregnancy, as pregnancy advances and during labour, delivery and early life, the external environment exerted an increasing influence. Although those who were biologically more vulnerable appeared also to be more vulnerable to the stress of a poor environment; they repersented only a very small proportion of the children who, at the end of the first decade of their lives, failed to function adequately. Ten times more children in the sample had problems attributable to the effects of a poor early environment than to the effects of serious perinatal stress. It showed that IQ differences between children with severe perinatal stress growing up in a favourable early environment and those with stress growing up in an unfavourable environment were much larger than differences between children with and without perinatal complications growing up in an adequate family environment. In other words the effects of environmental deprivation were found to be more powerful and accounted for much more of the variance in IQ than degree of perinatal stress. Moreover among services required for these children by age 10, by far the greatest need was for long-term educational or mental health services or both. However, it should be kept in mind that the Kauai Study was done on a sample where excellent provisions have long been available for health and medical care. One cannot be too sure as to what the results will be, were such a study been done in India, where the facilities for health care are minimal. Yet one cannot question the fact that health care and nutrition minus the required educational stimulation will not pay much dividends.

All the recent studies suggest that early childhood is the most vulnerable stage and that intervention at this stage offers the greatest promise for substantially reducing the casualties among the young. Remedial measures have to be started right from early years for which closer cooperation is required between the various professions attending the birth and care of the child. These services should aim at spotting early developmental failures in children suffering from deleterious perinatal conditions and to provide them with a supportive and stimulating environment to minimize the effects of early damage.

Keeping in view these trends of research studies, a number of preschool programmes have been started for disadvantaged children. The Head Start Projects of U.S.A., the Preschool Groups of Great Britain, the special nutrition programmes for preschool children in India etc. are examples. Recently the Swaminathan Committee submitted a report on the study of the preschool child which has suggested ways and means of stimulating young children in India. What is perhaps required is to make it possible for all agencies that serve children to pool their resources to provide more efficient physical and mental health services as well as to provide cultural and educational stimulation for the children and their parents. This should help the country to stem some of its overwhelming problems.

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PURPOSE: *Indian Educational Review* is published twice a year, in January and July, by the National Council of Educational Research and Training, New Delhi. The purpose of this journal is to provide a medium for dissemination of educational research and exchange of experience among research workers, scholars, teachers and others interested in educational research and related fields and professions.

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1. Papers that contain original thinking in education or educational research.
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3. Papers that summarize and discuss an outstanding study or piece of educational research.
4. Papers that review significant research in important areas.
5. Letters to the Editor on important research problems.

The emphasis is on categories 2, 3, 4 and 5. Ordinarily a paper is not accepted if it has appeared in print in any form elsewhere. Exceptions may be made for contributions which the Editor considers should be made known to a wider public. In such cases, a copy of the publication in which the paper has appeared earlier should be sent with it.

Manuscripts sent for consideration should be typed double-spaced, on one side of the paper only. References in the text to the work of other researchers should be made by giving the name of the researcher, and the year in which his research was published, in round brackets and *not* in the form of serial numbers which connect with the list of references at the end. Typescript in duplicate should be sent to the Editor, and at least one copy retained by the writer for reference.

Tables, charts and graphs should be finalized carefully before sending. They should be clearly and accurately captioned and inked to size, and their places designated in the manuscript.

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Science Education and Scientific Attitudes of Indian Students

V. Shekhawat

The author postulates that the philosophy of science essentially conflicts with the native Indian philosophy and that therefore in spite of concerted efforts the majority of Indian youth remain alien to science. Another barrier to learning science is the foreign language employed. The author examines these issues and goes into the implications for the methods and materials of science teaching arising from this conflict.

Nearly two and a half decades have passed since the famous philosopher of science, F.S.C. Northrop, pointed out the way that would lead to a scientific civilization for Asians and their brothers of the Third World.

> It is frequently assumed by native leaders of non-Western societies, and also often by their Western advisers, that the problems of introducing modern scientific instruments and ways into Asia (The Middle East and Africa) is merely that of giving the native people their political independence and then providing them with funds and the practical instruments. This facile assumption overlooks several things. First, the instruments of modern science derive from its theory and require a comprehension of that theory for their correct manufacture and effective use. Second, this theory in turn rests on philosophical as well as physical assumptions. When comprehended, these philosophical assumptions generate a personal and social mentality and behaviour quite different

> from, and at points incompatible with, the family, caste and tribally centered mentality and values of the native Asian...people. In short one cannot bring in the instruments of modern physics without sooner or later introducing its philosophical mentality, as this mentality, as it captures the scientifically trained youth, upsets the old familial and tribal moral loyalties. If unnecessary emotional conflict and social demoralisation are not to result, it is important that the youth understand what is happening to them. This means that they must see their experience as the coming together of two different philosophical mentalities, that of their traditional culture and that of new physics. (F.S.C. Northrop in Heisenbarg, 1958).[1]

Many scientists and philosophers[2] from the west as well as the Third World have turned considerable attention toward the problem of scientification of these oldest known civilizations, toward the problem of economic regeneration of these potential people. However, even today the problem remains; even today most of the countries of the Third World, save China, have failed to infuse science in their native cultures; even today a sufficient founding in scientific concepts and attitudes that would guarantee the creation of an everlasting edifice has not been achieved. This is so when many countries, affluent today, guided by the scientific thoughts of Marx, spun off from the capitalist fold and built up their own indigeneous scientific cultures. Beyond doubt, their methods have not been much different from what Northrop has expressed in those few words.

In India, the problem, (and it remains) is that of the youth acquiring a *grounding* in science, a *mentality* of science, an *attitude* of science. In almost every university science education is a 'must'; almost every department of science offers courses comparable to any American or Western university; millions of rupees are spent in buying the latest equipment; professors pay regular visits to leading universities of the world to refresh their memories and to acquaint themselves with the latest approaches adopted;[3] Western advisors are invited periodically to guide the local persons in the lead in running the machine. To sum up, the sweat is being shed by local hands to temper the steel with foreign tools. The end results achieved so far reveal the essentials of a miscarriage, the signs of an imposed alien dead weight. To define the problem precisely: What is the reason that in spite of concerted efforts, the majority of the cross-section of Indian youth remains alien to science? Why, even today, is there a lack of deep *conceptual* understanding of the essentials of science? Why, even today, has there not occurred any fundamental breakthrough in the appreciation of theoretical structure of science? To answer these questions, it is essential to investigate those essentials of the Indian philosophy that have acquired a permanent hold on the Indian mind, and also to examine these essentials vis-a-vis the essentials of the philosophy of science. If these are basically conflicting and alien, it is necessary to inquire into our *methods* of teaching, the *language* of teaching and the patterns of *book designing*, and to point out the main pitfalls that should, sooner or latter, be completely overcome.

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[1] W. Heisenbarg, *Physics and Philosophy*. George Allen and Unwin London, 1958.

[2] *Criterion for Scientific Development*. E. Shils (Ed.), The MIT Press, Mass., 1968. Two important contributions in this book are: M. Polanyi, "The Republic of Science" (pp. 1-20) and S. Dedijer, "Underdeveloped Science in Underdeveloped Countries," (pp. 143-63).

The Essentials of Native Philosophy

The *Gita* and its philosophy have had the widest influence in India,[4] and even today most of those students who are first- or second-generation literates, coming from rural India, have a basic knowledge of the philosophy of the *Gita* which has its central point the principle of *karma*. According to this principle, as it is understood by the majority of the people, there is an *atman* that is eternal and indestructible, exactly contrary to which there is the human body that is transitory and perishable. Every *action* performed by a living being is an action by this *atman* and is meaningful in that its imprint is stored in the *atman;* when one body perishes, *atman,* along with all stored actions, nucleates another embryo and a new body grows around it. The new body is influenced by the stored actions (*karma*) and its future is determined by these. So general and davastating has been impact of this principle that the castes who had vested interests succeeded in explaining the whole established system by this principle; even today astrology is upheld by this, even today the caste system stands on this principle, even today people are contented with poverty and hunger because of this principle. This principle stands as the strongest barrier against Darwin's theories of human evolution, Marx's theories of societal evolution and Freud's theories of psychology.

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[3] A hint or glimpse of how hard they had to work in the U.S.A. for a proper scientific education is found in an article on science—H.A. Smith and K.E. Anderson in *Encyclopaedia of Educational Research* (Ed. C.W. Harris), The Macmillan Co., 1960, (3rd edn.), pp. 1216-32.

[4] By not mentioning science here, it is not intended to ignore the fact that the sciences had grown in ancient and medieval India. A good, historical account of this is found in: G.S. Diksit, "The 'Sivattva Ratnakar' as a source for Sciences in Ancient and Medieval India", *Ind. J. of Hist. of Sc.*, *4* (1 and 2), May-Nov., 1969, pp. 11-14. In the same journal see: J.M.P. Mahadevan, "Philosophical Trends vs. History of Science of India," pp. 27-41.

Misinterpreted and distorted philosophies of *yoga* have an equal influence on the people, *supported by the principle of karma.* Sadhus, wandering throughout the country, propagate this philosophy; they sustain *the myth of celibacy,* of acquiring godhood through introspection or meditation (*dhyan and Samadhi*). Yoga is a primitive science of psychology, based on a methodology of practice through introspection, which evidently rejects the criterion of public testability because all the experiences are private. Yoga propagates the myth of supernatural powers (*vibhutis*) and is a kind of magic for the people; it shows a contempt for the material sciences and provokes people to renounce this 'illusory' world; it rests on total faith in the Guru and the God and gives a secondary place to reason; it is based on *devotion* and *persistence* and rejects an attitude of questioning and learning through experience.

Three widely accepted methods of pramana[5] are *experience, inference,* and the *word* (*pratyaksa, dnuman, Sabha*), but they carry different weightage in that experience is the most reliable, inference is the second best reliable, and the word the third. However, due to socio-historic reasons, this concept of weightage has been forgotten, partly by the efforts of a cross-section of vested interests. In fact the major emphasis has been on the highest reliability of *sabda pramana,* and this again rejects the attitude of questioning and inquiry, demanding faith and devotion.

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[5] G. Srinivasan Murti, *The Science and the Art of Indian Medicine.* Theosophical Pub House, Madras, (pp. 6-25). Srinivasan has compared the Western scientific methodology with that which prevailed in India.

The teacher-taught relationship in India is today determined by these essentials. What is demanded of the pupil is total regard for the teachers; the capacity to memorise and learn without questioning (because whatever the teacher says, has to be relied upon); faith and devotion in the teacher and in what is being taught.

To sum up: in whatever distorted form the philosophies have been accepted by the people, as such they are all a challenge to science and the scientific mentality. There does not exist any Indian philosophy whatsoever that would support scientific theories and would help people in coming out of this bog of myth, superstition and blind devotion. It is precisely these established dogmas of the Indian Philosophy that science has to completely eradicate.

The Essentials of the Philosophy of Science

Experience is the basis of all sciences; all *formal* and *conceptual* theories of science—whether *deductive* or *inductive*—aim at analysing and understanding that which is experienced. What is experienced is an object and all objects are constituted of *matter*, and thus science aims at analysing and understanding the principle of matter, and in achieving this aim it also uses other methods of *pramana*, namely, inference and word. But all theories have to be designed in such a way that the experienced objects can be explained by them; precise statements of *observed phenomena* are called *laws* and are always of the form $(x)\ (Px \supset Qx)$, i.e., for every x, if x has property P, then x has property Q. These are conditional statements, and under some given conditions are tested by experiment.[8] Experiments involve an observer, an object and a process called *observation/measurement*. There are at least three well known rigorous principles of experimenting, namely, *minimum observer involvement, guarantee of a contact between the observer and the object, and inter-subjective repeatability of measurement.* Every measurement ends with the noting of certain real numbers which are called data, these data being the facts with which any theory that proposes to explain the measured phenomenon must correspond.

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[8] For a good exposition of philosophical aspects of natural sciences, particularly physics, see: Rudolf, Carnap, *Philosophical Foundations of Physics.* New York: Basic Books, 1966.

Every scientific theory rests on certain assumptions even if those are certain well known universal laws; the simpler and more obvious these assumptions, the more everlasting the theory. No theory of science is sacred and it stands or falls depending on our *state of knowledge*. Every theory employs certain *concepts* which are socio-historically determined, which evolve and change. The more comprehensive the concepts employed, more comprehensive is the theory and the wider the field it covers. When old theories are challenged by expanded information, new theories evolve that are ever more general and ever more widely applicable.

Thus all scientific theories are founded in experience and all of them imply an essential practice of challenging assumptions; questions are the backbone of scientific evolution, and any theory, howsoever general, shall become dogmatic and ossified if it is accepted *in toto*. Theories are not thrown completely overboard; theories evolve, and in such a process they retain many of the older concepts.

The reader shall have grasped by now the conflicting principles of the phiolsophy of science and the native philosophy: one rests on the principle of evolving matter, the other on the principle of *karma;* one rests on public experience, the other on private experience; one rests on challengable assumptions, the other on invoilable rules of God; one demands a questioning attitude, the other demands a blind faith in the teacher and in what is being taught. Such are the opposing principles on which the two philosophies rest.

Language

Language is an ordered set of symbols, chosen arbitrarily, and ordered in such a way that they carry certain meaning. Thought and language both employ the unit of word-meaning, the meaning being an expression of a concept. Language is thus a means of communicating social concepts and thought is contingent upon this means of social concepts. In childhood, language and thought develop independently; at a certain stage there occurs a pre-intellectual phase in language and a pre-linguistic phase in intellect, and both become interwined.[7] The importance of language is in that thought is impossible without language. The evolution of language proceeds with the socio-historic evolution of concepts, and the more the concepts formulated and generated during a given period, the richer the language. In India the problem of language remains, even after many years of political independence, the geo-linguistic factor playing an important role. It is however a known fact, established after empirical data, that most of the languages in India contain rich elements of Sanskrit which is very close to Hindi. Acceptance of one of these languages as the prime means of communicating social concepts and incorporating in it all the geo-socially determined concepts from all the regions of the country would not only make the new language rich but also phonetically acceptable to the majority of the people. This indeed needs considerable research. Science is today, taught in a Western language, namely English, which contains the elements of Western thought and social concepts, these being totally alien to the students here. The result: If native philosophy is a barrier that conflicts with scientific philosophy at every step, the foreign language is a barrier that creates confusing concepts and undermines the natural process of thought. Such is the misery of an Indian science student so far as the language is concerned, and this misery can either be overcome by wiping out the native culture wholly or partially, or by communicating the ideas of science by means of a language that employs native concepts. Evidently the latter would be the most desirable remedy, however difficult it may seem.

Design of Syllabi and Books

Two grave problems that the science student in India faces have been pointed out above: the problem of conflcting philosophies and the problem of language. Whereas the prime task before those who devise the policies of science education is to solve, first of all, these two problems, there are other grave mistakes that are being continuously committed. One of them is the design of the syllabi and books of science, the other being the methods of science teaching.

The problem of conflicting philosophies has ever been overlooked in designing syllabi in the sciences, and this is the main source of the failure in developing scientific attitudes in the students. The only way to combat the damaging idealistic philosophy is to prepare a grounding in the philosophy and history of science for all students at the undergraduate level. For those students who opt for science at the postgraduate level a deeper understanding of the above should be required. To generate native concepts for a native philosophy of science it is essential to understand thoroughly what indeed the philosophy of science is, what the history of development of science has been and what type of thinkers were those who advanced it.

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[7] Vygotsky, *Thought and Language.* The MIT Press, Mass., 1962.

Many self-declared intellectuals argue that the teaching of the history of science would develop an inferiority complex in the students and create in them the myth of Western thought and thinkers. The same argument they employ for the design of books which they say must be designed in a logical sequence and not in a historical sequence. A close analysis will reveal that this belief is unfounded and that rejection of history is rejection of identity. Man should not feel ashamed of a knowledge of the fact that his ancestors were apes and not God. The moment we grasp the laws that govern the social evolution we realize why one section of the world happened to take the lead at the expense of other sections and why it is inevitable for all to pass through the same stages of evolution sooner or later. The problem is one of catching up with those who have left us behind, and that is possible only by learning about the path they have traced and drawing lessons from it. Ignoring history on the one hand and depending entirely on logic on the other would definitely be a serious mistake because even logic is not *a priori* and contains in it the elements of history. We cannot escape history.

In the designing of books it is therefore essential to explain the main problems to the youth, to prepare them for combating those principles of philosophy that conflict with sciences, to devise methods of *translating concepts*, to give a short introduction of the history of science and of the assumptions in which science rests, and to then present the theories such that they contain more of conceptual stuff than of formal stuff. The more such an awareness be generated in the student, the better shall become his understanding of science. Apart from this, the emphasis should be on the empirical, and concepts should be demonstrated to correspond with the experiments that uphold them.

Methods of Science Teaching

Those who teach are much more influenced by the native philosophy than those who are being taught, and therefore all the problems that were indicated in the second section are faced by the teachers. Most of the teachers, even if they have travelled widely in the west, fail to appreciate the conceptual import of science; they reward memorising, they dread questioning and fail to communicate to the student the conceptual essence of sciences. No distinction is made between applied mathematics and physics, and what is indeed being taught in the name of physics is applied mathematics. Physics is a philosophy of matter which employs a formal language like mathematics for the sake of preciseness and which relies heavily on experience. Applied mathematics on the other hand is a formal language that takes certain concrete objective examples to clarify its import; it does not bother about the analysis of matter or about the correspondence of its theory with experience. Separate the philosophy of matter and the experiments from physics and it would become applied mathematics, and that is indeed being done. The philosophy of matter is almost wholly misunderstood and miscommunicated and experiments are performed independent of the phase of exposing the theories to the student; there is not pointed out a correspondance between the theory that was just taught in the class and the experiment that is being performed. Many times it happens that experiments that support a theory are performed first in the laboratory while the theory is learnt later. Apart from this there are other academic problems for the teacher: his failure to keep in pace with recent developments, lack of motivation, degree of commitment for and involvement in science teaching. It would indeed be an ideal programme if dedicated teams of scientists organised trips in various schools and colleges to demonstrate small but interesting experiments of science to young students so as to instil in them an appreciation for science and its theories.

What is essential for teachers is to keep in mind the main problems delineated above while teaching the students of science and to modernize their concepts and methods by a continuous involvement in the scientific world.

Conclusions

The techniques adopted for scientification of education in India have not shown any fundamental improvement in spite of concerted efforts by those in the lead. This is so because the essentials of Indian philosophy, namely, the principle of *Karma* propagated by a *caste* of vested interests, the principle of *yoga* propagated by wandering *sadhus*, and other aspects like devotion to the teacher, agreement without questioning, acceptance without critical evaluation, still hold considerable sway in the minds of the Indian people, including the youth. Those essentials of the Indian philosophy are in direct conflict with the essentials of the philosophy of science and present a strong barrier to any propagation of the latter. Apart from this, there are problems of language and concept generation; of design of syllabi and books such that the philosophy of science could be appreciated by the young student and the sequence of presentation of the courses in books would be logico-historical; of the methods of teaching in which the teacher himself suffers from the above maladies, lacks conceptual understanding of science and fails to establish a one-to-one correspondence between theory and experiment.

The remedy for these problems lies in a compulsory grounding of all the undergraduates, uniformly, in the philosophy of science; acceptance of Hindi or Sanskrit as the means of communication of social concepts; design of syllabi and books keeping in view the local concrete socio-historical situation, the philosophy and the culture; radical improvements in the methods of teaching in which the teacher constantly keeps in sight the above-mentioned problems; and propagation of science by dedicated teams of teachers and scientists.

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Towards Mathematical Models of Teaching

S. P. Bhattacharya

The author reviews significant research on mathematical models of teaching and advocates further concentrated effort in this area of research.

A mathematical theory seems to be an inevitable development at the present stage of development of every branch of the science of human behaviour. Research workers of widely diverse views are found to agree on this (Brunswik, 1939; Skinner, 1938; Wiener, 1948; Travers, 1966).

Dear and Atkinson (1962) write in this connection: "It does not seem necessary to present any argument here in support of the use of mathematical models in social science research, as the value of this method of study is now widely accepted." They point especially to the successes that mathematical modelling has had in three social science areas whose problems seem to overlap sufficiently with those of a programme of teaching, namely: (i) mathematical learning theory; (ii) the theory of test design for measuring intelligence and achievement; and (iii) mathematical programming of dynamic problems like production scheduling, inventory control and process study.

Research on teaching, at present, is mainly 'descriptive' (Smith, 1956) and occasionally 'experimental' (Glaser, 1965). Though the majority of the studies are not 'prescriptive' (Bruner, 1966), fortunately they are not data-free. In a way, research on teaching is rich in the variety and quality of available data necessary for preliminary model building. Empirical studies on teaching, both survey-type and experimental-type, have approached a critical point from where model building may safely take off. Bush and Mosteller (1951) pointed out this direction of research in no uncertain terms: "Mathematical models of empirical phenomena aid the development of science when a sufficient body of quantitative information has been accumulated. This accumulation can be used to point the direction in which models should be constructed and to test the adequacy of such models in their interim states. Models, in turn, frequently are useful in organizing and interpreting experimental data and in suggesting new directions for experimental research."

Following the observations of Estes (1950) about the statistical model of learning, we can also advocate meaningfully mathematical approaches towards models of teaching. Reliable observational techniques and standardized collection devices used in 'classroom interaction analysis' (Flanders, 1970) and 'programmed instruction' (Fry, 1963), enable the present-day researcher in teaching to obtain data which are orderly and reproducible enough to support exact quantification of the teaching process. Of course, some time is still needed for a comparable refinement of theoretical concepts and methods. What Estes (1950) said of learning may also be said of teaching in this matter: "The necessary interplay between theory and experiment has been hindered, however, by the fact that none of the many current theories of learning commands general agreement." Researchers on building theories of teaching are broadly classified into two groups: "describers" and "improvers". The reason is not far to seek. Theories of teaching are built around verbally defined hypothetical constructs which are susceptible to certain disagreement on verification. To wait for the resolution of the varied disparities among the competing theories of teaching will be time-consuming and, also, will in no way help their resolution. The resolution rather lies in the way of systemization of "well established empirical relationship at a peripheral, statistical level of analysis" (Estes, 1950). The possibilities of unifying the diverse explanations of basic concepts in theories of teaching may be fruitfully explored through a set of experimentally manipulable variables, and by strict mathematical reasoning (Haddan, 1970).

MATHEMATICAL MODELS OF LEARNING

Although the term "mathematical models of teaching" has not come even in occasional use in the literature of educational research, the same in learning is frequently used in psychological research From 1870 onwards, the mathematical treatment of psychology, especially the branch of learning, has gradually evolved through experimental studies, psychometric studies, factor-analysis and finally, in 1950, statistical studies.

Factor analysis techniques were developed and refined by Spearman (1927), Thomson (1951), Thurstone (1947), Kaiser (1956), Lawley (1940), Wherry (1959), and others.

Stochastic models were developed notably by Estes (1950), Bush and Mosteller (1951), Luce (1960), and others.

Information theory and cybernetics were quickly drawn into the field of learning by Shanon and Weaver (1949), McGill (1954), Attneave (1959), Luce (1960), Stolurow (1965), and others.

A mathematical theory of teaching is almost the fraternal twin of that of learning, and therefore the building up of such a theory of teaching cannot be delayed. Necessarily it will draw heavily from the past experiences and present trends of building learning theories. The building of a model of teaching like that of learning, will involve three basic steps:

1. Constructing a quantitative theory of the phenomena of teaching.
2. Deriving empirical consequences (prediction) from the theory for the parametric values, time, paths, equilibria and other characteristics of the phenomenon.
3. Testing these consequences by comparing them with numbers derived from the empirical data.

MATHEMATICAL MODELS OF TEACHING

Henderson (1965) gave a theoretical model of teaching in which he had used the idea of a relation as a set of n-tuples. Teaching, he conceived as a ternary relationship, T (x.y.z.), where T is the variable and x.y. and z. are component sets of teacher, pupil and subject variables, respectively.

Biddle (1964) offered a "seven-variable model" for the investigation of teacher effectiveness. Gage (1963) had categorized his model with those of Medley and Mitzel (1958) and Ryans (1960) as the "Criterion-of-effectiveness" paradigm. Carroll (1965) also developed a comprehensive model of teaching involving five variables; his model required the control of four variables by statistical methods like analysis of covariance or factorial design. Siegel and Siegel (1967) suggested a paradigm entailing multivariate analysis and provision for studying interaction among the variables. The study involved four classes of independent variables and two types of dependent variables.

Factor Analytic Models of Teaching

Attempts have been made to develop a model of teaching through factor analysis. Factor analysis may identify the primary abilities that constitute the larger, general teaching ability as well as the specific teaching abilities of different subjects at different grade levels and thus help to build a factorial model of teaching. Spearman's two-factor model, Holzingers' bi-factor model, Thurstone's multi-factor model, Wherry's hierarchical-factor model—any and many of them may be experimentally utilised to study teaching ability. In fact, a large number of studies have already been done to gain insight into the teaching process through factor analysis (La Duke, 1945; Rostker, 1945; Hellfritsch, 1945; Schmid, 1950; Ryans, 1952; Erickson, 1954).

Stochastic Models of Teaching

The statistical models of teaching may be deterministic or may contain random elements. Theories incorporating random elements are called, stochastic. These probabilistic models are becoming popular in the social sciences, especially in different branches of psychology. Stochastic models can be interpreted in either of two ways: (i) the random elements can be regarded as an integral constituent of the subject, or (ii) the model is regarded as an artifact for summing up the unpredictable resultant of a host of minor and additive factors that influence behaviour. Researchers in learning theory are of the view that stochastic models in learning, in view of the existing limited knowledge of neurophysiology, seem likely, for a long time to come, to play a major role in advancing knowledge of human behaviour. Bush and Mosteller (1951) said: "We do not take a position of strict determinism with respect to behaviour and its prediction. We tend to believe that behaviour is intrinsically probabilistic...."

Although Estes (1950) initiated a movement toward a statistical theory of learning and vigorous researches have been done along the direction, no serious attempt has yet been consciously made to examine the possibility of their usefulness in building models of teaching. A few scattered attempts have, of course, been noticed.

Dear and Atkinson (1962) developed a somewhat mathematical model of the teaching process which was concerned with a simple situation in which only two concepts were being taught. A "two-state Markov chain" mathematical learning model was used as the principal tool for developing the teaching model. The study originated at the branching problem of a two-concept programme for efficient teaching.

Flechsig and Heipche (1969) proposed a didacometric model which is valuable in theorizing the "interactive process" in teaching, because it is based on a special stochastic matrix relating the factor for the initial distribution to that of the final distirbution of achievement scores. Didacometry, therefore, denotes a new field of instructional measurement which is concerned with the development and adaptation of mathematical models which allow us to measure the effectiveness of instruction.

All in all, the roles of probability in a stochastic model of teaching will be:

1. Assumptions that the teaching behaviour is determined only probabilistically by the elements of instruction.
2. Assumptions that the behaviour is not solely determined by parameter values, but is subject to influence by myriad unknown causes.

Cybernetical Models of Teaching

The development of quantitative instructional models related to cybernetics has had its beginning within the last ten years. These models attempt to describe the process of optimalizing the sequence of instructional events in a controlled situation. Mallen (1969) writes:

"the application of cybernetics to the study of the learning-teaching system begins from the notion that teaching is basically concerned with controlling a learning process." He has also given a model, "a simple mathematical description of adaptive teaching (coupled Student-Teaching Machine) system" in Dunn and Holroyd (1969). Groen and Atkinson (1966) represented the instructional models as multi-stage decision processes which determine the efficiency of various orders of presenting learning materials. Smallwood (1962) formulated a simple instructional model in which the students' post-instructional performance is a function of the number and blocks of instructional matters and the probable time for working through these subject-matter blocks. Matheson (1964) investigated by means of the simulation technique a number of sub-optimal strategies for the response-insensitive instructional conditions and found a net reward return of 1 to 7 for optimal strategies. Computer simulation models of cognitive processes offer a theoretically rich class of quantitative instructional models. Feigenbaum and Feldman (1963), Reitman (1965) and others have done considerable work in this field. This trend of developing models of cognitive processes shows great promise for the future by providing a formal basis for comprehensive mathematical models of teaching.

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Validation Testing of Programmed Instructional Materials

S. P Mullick

The author describes in detail procedures for validation testing of programmed instructional materials.

Programmed instructional materials are educational materials from which students learn. These materials are presented in book format, in machines, or as teaching-learning systems operating through a network of devices, ranging from tapes, film strips, film loops and television to computers. These materials may be self-paced or group-paced. Whatever may be their form or mode of presentation they have certain common features. First, they require the student to focus his attention on a limited amount of material at one time. Secondly, they require him to respond in some way to each segment of material. Thirdly, they give him immediate knowledge of results. These three features constitute the learning cycle. Every student is kept thus engaged in each learning cycle and goes through a series of learning experiences as he completes one cycle after another. The activities in which the learner is required to engage at each step are selected and ordered on the basis of empirical tests. The steps in a programme are tested on samples of intended learners and are revised, if necessary, so that they contribute to the learning of the students. The strength of programmed instruction thus resides not in the product but in the empirical test in procedures employed in its production.

The empirical testing procedures may be divided into two categories, viz., developmental testing procedures and validation testing procedures. The aim of developmental testing is to revise and finalise the draft programme until the programmer is satisfied that the programme will be able to do what it was intended to do, viz., to change the performance capabilities of the intended learners. The aim of validation testing is to study how far the draft programme is successful in teaching the specified population in the natural conditions of its use. Viewing the whole programming process, the developmental and validation testing are the alternate phases like the two sides of a single coin. Thus for any developmental work there is validational work by the programmer. For example, when, the objectives of a programme are developed, then the validity of the objectives is studied. Similarly, when the content is written and its sequential analysis undertaken, the validity of the content and its sequence is studied. Each type of developmental and validational study is accomplished at the appropriate time. Those validational studies which are undertaken with reference to some component of a programme, viz., objectives, content, tests, etc., may be referred to as sub-validational studies.

Here we are concerned with the validation testing of the final draft of programmed instructional materials as they emerge from the cycle of revisions made during the developmental phase. The programmed material may be a lesson covering about 1-2 hours of instruction or a course lasting several hours of instruction. The validation testing of a programmed course and of a programmed lesson may be differentiated in terms of the scale of operations undertaken in the validation study. For example, in validating a programmed course involving administration of the programmed units for several days, it would be essential to control the extraneous factors, viz., concurrent instruction, before-and-after instruction, and other educational practices, the study of which can be dispensed with in validating a lesson. We shall consider first the validation testing of a programmed lesson and then of a course.

Validation Testing of a Lesson

This procedure may be adopted while testing programmed lessons of a correspondence course, or shorter programmes, particularly in industry where industrial workers are required to learn the skills of specific jobs necessitating a couple of hours of instruction. This procedure can be used in the developmental phase of a large course as

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well. Each course is developed in a sequence of programmed units, and a programmer may go on validating each unit, as suggested here, so that the final validation study of the course does not result in rejection of the course on account of a belated discovery regarding the inefficiency of the units of which it is composed.

As in all experimental studies, the programmer formulates the objectives of the validation study and writes the assumptions, if any, on which the study is to be based. As it is a finalised draft programmed lesson, it is assumed that the educational objectives and the content presented in the lesson are valid. The problems for investigation may be:

1. How far does the programme succeed in teaching the objectives to the intended population, with reference to the minimal acceptable performance specifications, and in how much time ?
2. How far is the sequence of the subject-matter taught, efficient ? Or, how far does it need change so as to optimise gain in learning in terms of the effort and time spent by the learner ?
3. In what manner do the students and teachers administering the programme react to the teaching and testing strategies employed in the programmed lesson ?

Tools for conducting the study. In order to achieve the aforesaid objectives, the programmer should develop:

1. An entry-level test consisting of test items or testing situations designed to demonstrate the performance capabilities of the student before he is eligible to take the programme.
2. A criterion test consisting of test items or testing situations designed to demonstrate achievement of all the objectives of the programme. This test shall include appropriate test items for each behavioural requirement stated in the objectives. Thus, if an objective specifies verbal performance, there should be the relevant verbal test item, and if the objective specifies discrimination or motor performance, the test item should also be of the same type.
3. If the criterion test is lengthy, then an achievement test,

viz., a condensed version representing the criterion test, should be used.

4. Two questionnaires, one for the students and one for the teachers administering the programme, should also be developed for obtaining their opinions on the steps, sequencing, test items and administration of the programmed lesson. A sample of these questionnaires is given in Annexures I and II.

Procedure for conducting the study. The students should be representative of the population for which the programmed lesson has been developed. As the student population differs from one area to another or from one school to another, it is advisable that the validation study be replicated in different areas in a number of representative schools.

The teachers supervising the lesson should be acquainted with the procedure of administering the programme. They may be asked to study the questionnaire to be filled in by them after the experiment is over. In order to answer the items in the questionnaire, it may be advisable for the teachers to keep a separate sheet in which they may go on recording reactions of the class as well as their own reactions while the experiment is on. They may be specifically requested not to help any student while he is working on a programme, but to record their comments on a separate sheet and then in the questionnaire after the experiment is over. It may be explained to the teachers that while positive comments and praise are pleasant, criticism would be much more valuable in helping us to improve the lesson. They should, therefore, feel free to be perfectly candid in their report.

A group of students numbering about 40-50, in a school satisfying entry-level specifications, may be assembled under the supervision of the teacher. They should be given a pre-test consisting of two parts. One part should be the entry-level test and the other part should be the criterion test or its condensed version. The administration of the criterion test is essential to calculate the gain scores, i.e., improvement in the behaviour potential after the programme has been completed.

The method of taking the programme should be explained to the students. The importance of first writing the answers on the response sheets and then checking them before going on to the next step should be stressed. It should, however, be emphasised that the questions in the programme are not to test the student but to provide him feedback as to whether to go on to the next step if he is right or to repeat the step if he is wrong. His answers, whether right or wrong, are important for studying the effectiveness of the programme. They should not, therefore, erase any wrong answer but put a 'cross' mark on it and write the correct answer by its side before going to the next step. It is advisable that students are given practice on the first few steps in the programme in order to ensure the proper conduct of the study.

The time to begin the study should be recorded. The time for completion of the programme should be recorded by each student as soon as he finishes it. After a student has completed the programme, he should be administered the criterion test and then the questionnaire intended for him.

A programmed lesson elicits hundreds of responses from the students. It is very difficult for the experimenter to check all the responses. It is, therefore, suggested that as soon as students complete the programme, post-test and questionnaire, each may be given the other's response sheets and asked to check the responses.

The teachers should be administered the questionnaire intended for them, at the end of the study.

ANALYSIS OF DATA

The Data collected by us is of two types. One is in terms of scores on pre- and post-tests and the responses on the response sheets, and the other is in terms of opinions of teachers and students.

Analysis of test scores. The scores may be analysed as follows.

1. The mean achievement score on the pre-test comprising the criterion test or its shorter version may be compared with the mean achievement on the post-test. The average time for the completion of the programme should also be calculated and interpreted in terms of the average gain in scores.

2. Gain scores of each student may also be calculated by subtracting the pre-test score from post-test score on the criterion test.

If some students passed the criterion test in the beginning, this means the programme was not meant for them. However, if several students are found to achieve more than 10 per cent score on the pre-test, it is advisable to calculate the actual gain by each student by the formula:

$$\frac{\text{Post-test score—pre-test score}}{\text{possible gain score}}$$

where possible gain score is the difference between the maximum score and the pre-test score.

The average of actual gain scores may be calculated and interpreted.

3. The students may be ranked in terms of their pre-criterion test and post-criterion test scores and rank correlation coefficient may be calculated. This coefficient will indicate the relationship between the student's position before the programme and after the programme.

4. The score on the entry-level test (Part 1 of the pre-test) may also be examined The post-test scores of those persons who did not satisfy entry-level specifications, may be scrutinised. The assumption is that if they failed on any item in the entry-level test, they would be weak on the related criterion-test items. If this assumption is not confirmed then the programme needs some modification in entry-level specifications.

Analysis of the Responses of the Students

The wrong responses may be crossed in red ink. The number of students committing a mistake at each step should be calculated and their percentage worked out. This percentage is called the error rate of the step. If it exceeds 10 per cent then that step is liable to be scrutinised because errors committed on these frames signify failure in imparting the intended instruction. It is advisable to prepare a list of common errors made on such frames. Then a brief summary statement of students responses may be prepared in a form such as: "S. No.——— 25 per cent, 15 per cent electrical energy, 10 per cent electricity; correct response, energy." This notation indicates that the particular step has an error rate of 25 per cent. Fifteen per cent of the students wrote "electrical energy" and 10 per cent wrote "electricity" whereas the correct response is "energy" revisions can than be made, if deemed necessary.

Opinions of the Students and Teachers

The responses to the closed-ended and open-ended questions may be analysed as follows.

1. The response to the closed-ended questions may be analysed by frequency counts as in opinion polls. For example, if the question is, "Did you feel that the programmed lesson was too lengthy to complete in one sitting—'Yes/No' ", the interpretation would be that so many persons out of so many replied that the programmed lesson was lengthy and may (or may not) be divided into smaller units, depending upon the percentage of 'Yes' or 'No' responses.

2. The responses to open-ended questions in which the respondents are requested to explain their answers may first be analysed by frequency count by classifying their opinions as favourable or unfavourable to the situation mentioned in the question. The detailed responses may be subjected to content analysis. For the analysis a unit may be taken as any statement made by a respondent which pertained to the situation. The statements may be classified as +1, 0 and —1 accordingly as they express a positive, neutral or negative opinion. Assuming that an attitude is a mental disposition to respond to a situation and an opinion is a verbal statement indicating an attitude, coefficients of attitudes pertaining to these questions may be calculated by the formula:

$$\text{Coefficient of attitude} = \frac{(f+)-(f-)}{(f+)+(fo)+(f-)}$$

(i) Where (f+) is the frequency of the statements expressing a positive attitude.

(ii) Where (fo) is the frequency of the statements expressing a neutral attitude.

(iii) Where (f–) is the frequency of the statements expressing a negative attitude.

It will be seen that the above coefficient of attitude will lie between +1 and –1 and is a useful index for arriving at a conclusion about the aspect of the programme inquired into by a particular item in the questionnaire.

3. Some strong positive and negative opinion may be interpreted according to their frequencies for arriving at relevant decisions.

Validation Testing of a Programmed Course

The course has to be validated in the natural conditions of its use. As things stand in our schools, students satisfying entry-level specifications will vary in age, sex abilities, aptitudes, learning speeds and personality characteristics. The teachers supervising them will vary in qualifications, experience and attitudes. In addition, their role may vary from just supervision without intervention when the students are taking the programme to helping the individual students when called for, engaging them in group discussions, supplementing the programme by summary lectures, diagnosing weaknesses and providing remedial instruction to the weak students, and using extra instructional media like films, audio-tapes. The students will take the programme for one or two hours each day. Great care needs to be taken as to what transpires during the remaining 22-23 hours of each day. If some students engage in extra discussions or do more work than assigned or obtain special attention from teachers in the same topic, the results of the study may be contaminated by these conditions.

As the conditions in which a programme could be used are many, and the efficiency of a programme may be different on different segments of population, it is advisable to design the validation study so as to investigate the comparative efficiency of the programme when used on different groups of students, supervised by varying types of teachers under different instructional situations. A programmer may be interested to study the relative efficiency of his programme vis-a-vis the teacher-taught groups. In order to design such comparative studies, the programmer should decide about the following:

1. Grouping of students possessing varying combinations of age, abilities, sex, and personality characteristics so that various control and experimental groups could be sorted out at the time of study.
2. Types of teachers and their instructional roles:

3. The instructional conditions when the students are taking the programme as well as when they are engaged in other learning activities each day in school and at home.

Having defined the instructional situations the programmer shall write down the objectives and the assumptions, if any, on which the study would be based. The assumptions may be that the objectives set forth in the programme are valid and the programme deals with the subject-matter at a difficulty level which is suitable for the intended population. This implies that the content, examples chosen and language used are appropriate and consumable by the students. The objectives of the study may be as follows.

1. One objective may be to study how the programme fares with different segments of the 'target population'. What is the change in the achievement scores of different groups, possessing specific combinations of ability, aptitude and personality traits? What is the relative amount of the time spent by these groups? Which groups profit more and which profit less by the programme?

2. Another objective may be to study how far the programme fares in different conditions of use. Can it be used purely as a self-instructional tool? If not, does it work with the help of teachers and by the use of additional instructional media? And if so, how far does it work under different situations?

3. A third objective may be to study how far it fares in comparison with the existing teaching method (teacher-taught groups) in terms of time and gains in learning.

4. A fourth objective may be to study the attitudes of the students and teachers towards the subject, towards the programme, and towards the programmed materials in general. As the course may last for several months there may be some sequential change in the attitudes of the students and teachers. It can be that some teachers who did not like their roles in Programmed Instruction may show a negative attitude in the earlier part of the study but a positive attitude by the end of the study when they have had actual experience of Programmed Instruction as a labour-saving device in the hands of the teacher. It may be that many students, flushed with the joy of having a new self-instructional, easy-to-take tool show a positive attitude in the beginning but end up with the opinion that it was, by and

large, a 'boring' way of learning. It is thus advisable to study the attitudes at different points of time during the study.

5. The objectives of the programme may be classified into levels of mental behaviours like knowledge, comprehension, application, analysis, synthesis and evaluation as suggested in Bloom's taxonomy of educational objectives. The performance of different students on test items pertaining to these levels may be studied. In this case the objectives of the validation study would be to investigate the strength and weakness of the course in impatring instruction at each level.

6. The content of the course may be classified in terms of chains, discriminations, generalisations, concepts and principles, and the problem for investigation may be to study the strength and weaknesses of the course in teaching different types of content.

7. Sometimes the programmer is interested to study the efficacy of the course in terms of retention and/or transfer of training effects as evidenced by extensions of the range of application of the knowledge and skills developed through the programme to other situations and problems not dealt with in the programme. Specific objectives may be formulated in this respect.

Tools for Conducting the Study

The programmer should develop or obtain all or some of the following tools necessary for conducting the study:

1. Entry-level tests.
2. Tests to measure relative abilities, aptitudes, and personality traits on the basis of which students will be classified into various groups.
3. Criterion tests to be given each day.
4. Series of intermediate post-tests administered at larger intervals, say after every 25 hours of instructions, and the final post-tests.
5. Questionnaires to study the attitudes of the students and teachers before, after, and during the instruction.
6. Tests to be used to measure retention and/or transfer of training.

Procedure for Conducting the Study

The study should be conducted in various representative schools in different areas. The unit of observation may be a student. (If the study is done on a large population, this unit may be a class or even a school. In that case each sampling unit will count as a single observation no matter how many individual students are involved.) The number, nature and size of the experimental and control groups will be in accordance with the objectives of the study. The students in different groups should be representative of the population purported to be represented by them. The students and teachers should not be drawn from persons who volunteer to partake in the study but should be selected according to proper sampling procedures. The teachers should be assigned to different groups in such a manner that no bias occurs in the study. Random assignment of the teachers to groups is a potential safeguard against bias.

The teachers may be trained in the respective instructional roles they have to play. It may be explained to them that if two or more students belonging to different groups discuss their instruction, then the distinctiveness of each group will be lost and the evaluation blurred. They may be requested to cooperate and also obtain the cooperation of the students in this respect. The problems of cross-communication can be minimised by keeping the groups physically separate. The teachers supervising the groups which are not to be assisted by teachers should be requested to play their role effectively. They may keep a notebook for jotting down the relevant behaviours of students when they feel obstructed during the study but should not help them in any manner. The problem of teacher-intervention can be minimised by assigning teachers, who do not know the subject-matter being taught in a programme, to such groups.

The time schedules for administering various tests, programmed units, questionnaires may be written and the study may be conducted accordingly.

Analysis of Data

The data collected may be divided into three interdependent categories: (i) measures of abilities, aptitudes, personalities on the basis of which the groups have been divided; (ii) achievement scores, time scores and retention scores showing the effects of programmed instruction; (iii) attitudes and opinions of the students and teachers. The data may be analysed as follows.

Analysis of Differences among Groups in Gain Scores, Time Scores and Retention Scores, etc.

The mean of the actual gain scores of different groups may be calculated and 't'-test may be used when there are two means. When there are more than two means, single classification analysis of variance may be used. The shortcomings of these techniques are that they do not take into account the initial differences among the groups. If it is intended to take initial differences into account then the analysis of covariance may be done.

The study of differences among groups may be done through double-classification analysis of variance by classifying the observations along two factors; one factor may be the instructional group, and the other, the entry-level behaviours. This analysis will show whether the main effects arising from the differences among the instructional groups and among the entry-level behaviours are significant and whether the interaction effects arising from the joint effects of intructional method and entry-level behaviour are significant.

The means of the gain scores of different groups in different segments of the programme that teach knowledge, comprehension, analysis, or the different segments that teach chains, discriminations, concepts, etc., may be analysed in the same manner to study the strengths, and weaknesses of various segments of the programme.

The means of time scores and retention or transfer-effect scores of different groups may be calculated and subjected to similar analysis.

Analysis of the Interrelationships of Programme Effectiveness with Different Variables under Study

This analysis can be done by calculating correlations among the variables and the amount of change brought about by the programme. For example, correlations between aptitude test scores and gain scores may be calculated to study whether the bright students end up knowing more than the less bright ones. The correlation between time scores and the gain scores will tell us how the fast learners have gained as compared to the slow learners. Correlations between the attitudes and the gain scores will reveal the kinds of students that profit more from the programme.

Analysis of the Attitudes of Teachers and Students

The content analysis of the opinions may be done as explained before. As the opinions have been obtained at different points of time, the indices of opinions like the coefficient of attitudes of different groups of students and teachers at different times may be plotted on graphs and their trend studied. The coefficients of correlation between the attitudinal scores and the gain scores, time scores, rentention scores and/or transfer-effect scores may be calculated to study their interrelationships group-wise.

Writing the Report of the Validation Study

The report on the validation study should contain information about all the aspects of the programme's effectiveness which were investigated by the study so that any user gets total information about who learns what and how much, under what conditions and in how much time. The report may therefore summarise the objectives, the description of the intended student population and the try-out population on which the validation testing was conducted, the description of the conditions in which the programme can be used and the conditions in which it was tried, and the effectiveness of the programme in various situations.

Enough information about the experimental design of the study and the statistics computed should be given in the report so that the reader is able to draw his own inferences about the efficacy of the programme. The means of gain scores, time scores and retention scores, and coefficients of attitude, or any other inferential statistics should be quoted along with an explicit indication of how these statistics were calculated.

In the end, the report should give suggestions on how to use or adapt the programme most effectively in different conditions.

ANNEXURE I

TEACHERS' OPINIONS

Title of the programme ——————————————————

——————————————————

No. in class——————————————————

1.1. Did you find that any frames were difficult for students ?

1.2. If so, which frames ?

1.3. Why do you think they were difficult ? (It may be that many students called you for help at particular frames.)

——————————————————

——————————————————

——————————————————

1.4. How could they be improved ?

2.1. Did you find any frames that were too easy ?

2.2. If so, which frames ?

2.3. Why do you think they were easy ? Would you like them to be all together, or would you like them to be modified ? Explain your views.

3.1. Did you find any items in pre-test or post-test very difficult to administer ? If so, which items ?

3.2. In what way they were difficult ?

——————————

3.4. How could they be improved ? ——————

——————————————————

——————————————————

4.1. Did you find any items in the pre-test or post-test very easy ?

4.2. Do you think they need be made more difficult? If so, in what manner ?

5.1. Did you find any difficulty in administering the programme ? If so, explain.——————

——————————————————

5.2. Did you find any difficulty in administering and scoring the tests ? If so, explain.

——————————————————

ANNEXURE II

Name——————

Class——————

Age——————

Yo have just taken a programmed lesson on——————. You are now requested to give frank opinion on the following points about the programme. Needless to state that your opinion will help us to improve the programme.

1. Did you feel that learning by the programmed lesson is easier than if you were taught by the lecture method or by a non-programmed lesson, i.e., straight presentation of the material?
——————————

2. Do you think that in order to get mastery over the subject, you would require more practice than is provided in the lesson? ——————————
——————————

3. Did you find that any frames were too difficult? If, so, which frames? ——————————
——————————

4. Did you find that any frames were too easy? If so, which frames? ——————————
——————————

5. Did you find that any items in the post-test were too difficult? If so, which items? ——————————
——————————

6. Did you find that any items in the post-test were too easy? If so, which items? ——————————
——————————

7. Do you feel that after the lesson is over there should be a discussion on the subject-matter by the teacher? ——————————
——————————

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Linear and Branching Programmes in Supervised and Non-Supervised Situations

Mohammed Husain

The author reports a study undertaken to compare the efficacy of linear and branching programmes in supervised and non-supervised situations, among rural and urban students.

Programmed learning has attracted the attention of educationists and psychologists because of its sound base in the theory of reinforcement, its characteristics of facilitating individual study, self-pacing, the high level of achievement realised through it, and its capability to handle certain problems of classroom teaching. Studies in India and in Western countries have proved the efficacy of this technique as compared to the traditional methods, in regard to a number of variables such as subjects, learners and situations. However, research is still needed in the Indian environment to answer some questions such as which style of programming—*linear or branching*—is more suitable for learning in different subject areas, whether it works in non-supervised situations with equal efficacy, and whether this innovation can be introduced in rural schools.

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STYLE VARIATION

The format and characteristics of the two styles of programming, namely, linear and branching, are contrastingly different.

In a linear programme, basically a conditioning model is used, with the assumption that a desired change in behaviour (or learning) can take place in the best way, if the response is first induced and then the desired behaviour is rewarded. (Skinner, 1964). The material is presented in a very short frame with a blank or question along with adequate prompts and cues, to which a learner has to respond overtly. The correct response is presented along with the frame which is first required to be masked and then to be tallied with the learner's own response. If his response is found to be correct he feels rewarded and thus the material is strengthened. Errors on frames are considered irrelevant and undesirable and their occurrence is restricted to a negligible number. This implies that the number of frames should be increased, all related concepts should be included, repetition should be done, and adequate cues should be provided. Such a programme becomes suited for, in the words of Markle (1964), "the lowest common denominator student." The basic characteristic of the linear programme, as compared to the branching programme, is that every learner, irrespective of his capabilities, either bright or dull or fast learner or slow learner, is required to follow the same sequence or path.

The format of the branching programme does not follow any learning model. In this case the material is presented in a comparatively large size of frame, followed by a multiple-choice question, with two or more alternatives, along with the page numbers written against them. After having selected the alternative, the learner is required to turn the page number given against the alternative where he is told whether he was correct and why he was correct. Then he is presented the next bit of information. The learners may be directed to different streams according to their individual requirements. A bright learner with adequate prerequisites may finish the programme much earlier, by going through the main stream whereas a slow learner may be branched to different remedial materials wherever he fails to respond correctly.

The controversy of efficacy between these two styles is sterile (Dunn and Holroyd, 1968). A brief review of claims put forth by the exponents of linear and branching programmes may however be given here.

A linear programme meant for "the lowest common denominator students" is unable to cater to the needs of a fast learner whereas in a branching programme an individual is asked to go through branches only when he demonstrates the lack of prerequisite knowledge by committing an error. Thus there is established a one-to-one ratio between the learner and "the teacher in the programme" (Crowder, 1954).

A linear programme attempts to reduce the number of errors whereas the branching programmer does not get disturbed by erroneous response since it can be corrected before the learner is allowed to go ahead. The linear programmer makes "the most pessimistic possible set of assumptions about the students" (Crowder, 1954).

The linear programmer does not have internal control over cheating, which means skipping the frames, looking back the correct answer first, mere copying, etc. Fry (1963) is so much distressed over the issue that he recommends the use of linear programmes through teaching machines only. Though Homme and Glasser (1959) do not believe in cheating, Green (1963) continues to believe that cheating has a definite bearing upon the quality of learning. In this respect, branching programmes have internal control over cheating and thus are better than linear programmes.

Rowntree (1968) believes that linear programmes are better for the teaching of facts and languages, whereas branching programmes are better for presenting ideas in their wholeness rather than for fragmented recall. He feels that topics suiting to one style and prepared in the other may injure the subject-matter as well as the student's dignity (Rowntree, 1968).

Linear programmes do not include any search activity and "traditional prompts are specially harmful for heuristic processes. If you teach a pupil in small steps, this will not contribute to the development of the qualities needed for search, because solving creative problems often demands rather long and intensive search" (Landa, 1962).

In the opinion of Landa (1962), branching programmes are better for training in heuristic processes and problem-solving activities.

The issue has attracted researchers and a good number of researches comparing the efficacy of linear and branching programmes are available. Lukerman, Marshall and Croesberg (1961) experimented on three response modes—conducted response (linear), multiple-choice (branching), and true-false type—and found no significant difference in criterion performance. Ree and others (1960) found no significant difference in criterion performance, but the branching programme had to its credit less completion time. Coulson and Silberman (1959) found the linear programme more effective in terms of performance but it took more time. Beana (1962) found that without any significant difference on the level of performance, branching programmes can teach in much less time. Larkin and Leith (1964) also arrived at the same conclusion.

Landa (1962) summarises these studies. Thus striking result of these studies is the fact that the data obtained are in many cases incompatible or even contradictory. One group of researches comes to conclusion that branching programmes are better than linear programmes, and the second group thinks that linear programmes are better than branching programmes. A third group decides that there is no difference between the two.

Situation Variation

The programmed learning material can be given to the learner under two situations, namely, supervised and non-supervised. The supervised situation requires the teacher to be present throughout the learning process, performing a number of functions in the classroom, such as distributing the programmes, giving instructions and illustrations, supervising the classroom, maintaining discipline, intermittently checking the answer-sheets of the students, helping the students whenever necessary and administering the criterion test in the end. This supervised situation helps in internally motivating the learners, in putting a check on manipulation and cheating activities, and in giving a sense of security to them. In spite of these advantages, the supervised situation has certain limitations. For example, the radically different rate of completion of the programme creates some administrative difficulties in the classroom. Further, the individuals work under group pressures and "a slow learner may be tempted to take unnatural speed in reading, he may hurry up and try to maintain the pace of the faster students" (Gotkin, 1964). Interference by the teacher may hamper the auto-instructional characteristic of the programmed learning material.

The non-supervised situation means absolute or partial absence of the human teacher during the process of reading the programme. This situation can be created by the withdrawal of the teacher from the classroom, by asking the students to sit wherever they like and by giving the programmes to the students for home-study. This situation has the advantages of providing a free atmosphere to the student, providing him adequate time to think and concentrate more deeply and independently, freeing him from the group pressures, saving the valuable class time and providing opportunities to develop self-study habits. If programmed learning material can work under the non-supervised situation without sacrificing the quality of learning, it has far better prospects. Most of the educationists would prefer the use of P.L.M. for remedial instruction and enrichment instruction, rather than for regular instruction. At school or college level, P.L.M. can be used for complementation, supplementation, enrichment remediation, and review of regular instruction. P.L.M. can also be used for continuation education, adult education and correspondence education, if it can work well even without the supervision of any human teacher.

Attempts to answer the question whether P.L.M. can be used in the non-supervised situation, have been made by various researchers. A study done at Huntington, Long Island, with a spelling programme concluded that the students working at home gains equivalent to those who worked in school under supervision (Gotkin, 1964). A similar experiment was done at Hillside, New Jersey, and it was found there was no significant difference in the achievement of the two groups. In this study the students showed a liking for working at home saying that "they get more time to think and they are not unnecessarily hurried" (Gotkin, 1964).

Basu and others (1968) compared conventional lessons with programmed lessons, in a correspondence course (which is a completely non-supervised situation) and concluded that "this study tends to indicate that programmed instruction when given through correspondence could be at least as effective as when it is given in the normal classroom situation." But the authors have mentioned that it is particularly so "when the students are pre-motivated and fairly mature." Jacob and others (1966) found that classes taught by programmed material alone learned significantly less than those taught by either a teacher alone or by a combination of both.

Bertz, Wayne and others (1965) indicate that P.L.M. is more effective when teachers supervise the college students' completion of the programme than when there is no teacher supervision. But Frank Ryan (1969) did not find any significant difference between the two groups, given the programme under the suprevised and non-suprevised situation. In India, Mullick (1968) gave a programmed correspondence lesson to one group and a conventional lesson to another group of B.Ed. correspondence course students and found that the experimental group achieved significantly better.

Environmental Variation

Although there is not much evidence, on the issue, it is assumed that the two types of environments—rural and urban—gave rise to different characteristics among the study habits of the students. The needs of rural students are different from that of urban students, and the former get comparatively inferior type of academic environments inside and outside the school. But unfortunately most of the innovations, new trends and practices are experimented with and tried in urban schools only and do not reach the rural schools. This state of affairs is unhealthy for India because a great majority of the student population of India resides in rural areas. The researches so far done in other countries do not provide any evidence on the variable of rural/urban setting. No research has so far been done in India in which this variable was studied, except in one case for which the data were collected from rural areas. (Shah and Kapadia, 1970).

Keeping in view the three treatment variations, viz., style variation, situation variation and environmental variation, the present study was conducted to find out the comparatve effectiveness of Programmed Learning Material.

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Purpose of the Study

The objectives of the study were as follows:

1. To develop the programmed learning material on one unit of geography in two different styles, namely, linear and branching.
2. To compare the relative effectiveness of:
   (a) Linear and branching programmes.
   (b) Linear programmes under supervised and non-supervised situations.
   (c) Branching programmes under supervised and non-supervised situations.
   (d) Linear supervised and branching supervised situations.
   (e) Linear non-supervised and branching non-supervised situations.

For the present investigation the term 'relative effectiveness' refers to only one criterion, that is, the level of performance of these treatment groups measured by the post-test given immediately after the completion of the programme.

SAMPLE

The subjects were 194 pupils—boys and girls—of Standard IX, studying in five schools, of which three were rural schools and two, urban schools, in Baroda. The students were randomly assigned to four treatment groups. The age of the subjects ranged from 14 to 18 years.

MATERIAL

The following material was used for the conduct of the experiment:

(i) Linear Programme
(ii) Branching Programme
(iii) Criterion Test
(iv) Intelligence Test.

(i) *Linear Programme*

A programme on 'Factors Affecting Air Pressure' was prepared by the investigator in the linear style. The development of the material was done according to the specifications of developmental procedure. The programme consisted of 81 linear frames, and two types of response mechanism—blanks to be filled in, and two alternatives of which one was to be selected—were used. The correct response were given on the left-hand margin of the frames required to be masked with a slider.

(ii) *Branching Programme*

The second tool for investigation was a branching programme, written on the same content. This was also prepared by the investigator according to the developmental procedure advocated by the programmers. There were 22 prime-path frames and 21 remedial frames, two frames being printed on one page. The frames fulfilled all the requirements of a standard branching frame. The order of frames and pages were scrambled according to the specifications of the branching textbook.

(iii) *Criterion Test*

To measure the performance of the students after reading the programmes given under different situations, a criterion test was needed, common to both the programmes. The criterion test was also prepared by the investigator according to the procedures of programmed learning. The criterion test consists of 15 questions and 37 objective-type items out of which 16 were of the recall/recognition type and 14 were of the matching type.

(iv) *Intelligence Test*

In order to measure the intelligence of the students, which was assumed to be an intervening variable affecting the criterion performances of the students, the Desai-Bhatt Group Intelligence Test was used. It is a verbal test in Gujarati, standardized on a large population in Gujarat.

EXPERIMENTAL TREATMENTS

The comparative nature of the study necessitated the four treatment groups which were as follows:

(i) Linear supervised group

(ii) Linear non-supervised group
(iii) Branching supervised group
(iv) Branching non-supervised group.

A brief description of these treatments is given below.

(i & iii) *Linear and Branching Supervised*

The linear and branching programmes were given to the two groups of the students in the same classroom. The investigator distributed the programmes and gave instructions as to how to use them. Then the students read the programmes. The investigator was present all the time in the classroom for maintaining discipline, intermittently checking the answer-sheets of the students in order to ensure that they were not involving in manipulative activities, specially in the case of linear programmes, and clarifying doubts whenever necessary.

(ii & iv) *Linear and Branching Non-supervised*

The linear and branching programmes were given to the two groups of students. They were given the instructions and then asked to go to another room or the library and complete the programme. They were instructed to bring the programmes and answer-sheets as soon as they finished the reading. The investigator was not present while the students were reading the programmes.

PROCEDURE

The experiment was conducted in two phases, separately in the urban and rural schools of Baroda District.

First Phase: Urban Schools

The first phase of the experiment was conducted in two schools of Baroda city. The experimenter first administered the intellgence test. Then the entering-behaviour test was given to all the students. After this, the students were randomly assigned to four groups. Two groups were given branching programmes and two groups were given linear programmes. Instructions were given to them regarding the use of the programmes.

Then two groups—one linear and one branching group which were to be given the non-supervised treatment—were given additional instructions regarding the procedure of reading the programme and what they had to do after reading the programmes. They were asked to go to another room, read the programmes and come back with the programme and answer-sheets as soon as they completed the reading. The other two groups—one linear and one branching—were asked to read the programmes in the classroom itself under the supervision of the investigator. The investigator, besides helping those students who sought his assistance, tried to put a check on undesirable activities by the students, such as cheating or manipulating the programmes. When all the students had completed the programmes the criterion test was administered to all of them at the same time.

Second Phase: *Rural Schools*

The second phase of the experiment was conducted in three rural schools of Baroda District. The same procedure was followed in these schools also.

ANALYSIS AND INTERPRETATION

In order to get a general picture, the criterion scores were first analysed in terms of frequency distribution and percentages, which were important from the programming point of view The number of students getting various percentages of marks are shown in the tables below for rural and urban samples separately.

TABLE 1

Number of Students Getting Various Percentages of Marks on the Criterion Test (Rural Schools)

	NUMBER AND PERCENTAGE OF STUDENTS							
Percentage of Marks	*Linear Supervised*		*Linear Non-Supervised*		*Branching Supervised*		*Branching Non-Supervised*	
	No.	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*
Above 70	17	74	12	52	17	74	17	74
Above 60	20	20	19	83	23	100	21	92
Below 60	3	13	4	17	—	—	2	8

TABLE 2

Number of Students Getting Various Percentages of Marks on the Criterion Test (Urban Schools)

	NUMBER AND PERCENTAGE OF STUDENTS							
Percentage of Marks	*Linear Supervised*		*Linear Non-Supervised*		*Branching Supervised*		*Branching Non-Supervised*	
	No.	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*
Above 70	12	52	4	17	10	43	6	26
Above 60	18	79	13	57	16	70	23	100
Below 60	5	21	10	43	7	30	—	—

It can be observed from the above tables that in general all the programme treatments showed a minimum scores of 60 per cent with a slight variation among the treatment groups of both the samples —rural and urban. The programme treatments worked with equal effectiveness in rural schools also. It can be observed from the percentages of the scores that the linear supervised treatment was superior to all the other treatments, and the linear non-supervised treatment ranked the lowest in order.

Analysis of Covariance

For a better and more sophisticated analysis of the available data, the analysis of covariance was used. The comparison between the means of criterion scores of all the treatment was the criteria to judge the relative effectiveness of the treatment groups. For a reliable interpretation it is necessary to have matched the groups on the initial variable. But the groups were not so matched in the present study. So the analysis of covariance was used because through it one is able to effect an adjustment in final or terminal scores which will allow for any differences in the same initial variable (in our case, intelligence). The analysis of covariance enables us to test the null hypothesis and gives us a quantitative picture by making it possible to see at which level (.01 or .05) the differences exist.

The summary of the computation of analysis of covariance for rural and urban samples is given separately in the tables that follow.

TABLE 3

Analysis of Covariance of Criterion Scores of Rural Sample

Source of Variation	*df*	*SSX*	*SSY*	*SXY*	*SSYX*	*MSYX*	*SDYX*
Among Means	3	839.74	167.87	265.65	116·29	38.76	
Within Groups	87	7887.92	112.44	864.09	1317.79	15.14	3.89
	90	8727.66	1580·31	1129·74	1434.08		

After the computation of correlation and regression of the data, the significance of difference of adjusted Y means was calculated and found as given below.

Significance of difference at .05 level

=1.99 x .439=.87

Significance of difference at .01 level

=2.63 x .439=1.15

TABLE 4

Analysis of Covariance of Criterion Scores of Urban Sample

Source of Variation	*df*	*SSX*	*SSY*	*SXY*	*SSYX*	*MSYX*	*SDYX*
Among Means	3	219.61	112·30	59·28	106·93	35.64	
Within Groups	87	9529·22	1630·87	452.66	1609.35	18.38	4.28
	9	9748·83	1743·17	511.94	1716.28		

After the computation of correlation and regression and adjustment of the scores, the significance of difference of adjusted Y means was calculated and found as given below.

Significance of difference at .05 level

=1.99 x .483=.961

Significance of difference at .01 level

=2.63 x .483=1.24

The comparisons of various treatments and the significance of difference between any two treatment groups is shown in the tables that follow.

TABLE 5

Significance of Difference between the Adjusted Means of Any Two Treatments in Rural Sample

Treatment Groups	*Adjusted Means*	*Comparisons*	*Difference*	*Significance*
A. Linear Supervised	27.05	A&B	2.40	Significant at .01 level
B. Linear Non-Supervised	24.65	A&C	0.69	Not significant
C. Branching Supervised	27.74	A&D	0.16	Not significant
D. Branching Non-supervised	26.89	B&C	2.09	Significant at .01 level
		B&D	2.24	Significant at .01 level
		C&D	0.85	Not significant

TABLE 6

Significance of Difference between Adjusted Means of Any Two Treatments in Urban Sample

Treatment Groups	*Adjusted Means*	*Comparisons*	*Difference*	*Significance*
A. Linear Supervised	24.71	A&B	2.87	Significant at .01 level
B. Linear Non-supervised	21.84	A&C	0.84	Not Significant
C. Branching Supervised	23.87	A&D	0.01	Not Significant
D. Branching Non-supervised	24.70	B&C	2.03	Significant at .01 level
		B&D	2.86	Significant at .01 level
		C&D	0.83	Not significant

On the basis of the results of computation of analysis of co-variance given in the above tables, the null hypotheses were tested, and it was found that:

1. There is significant difference among the adjusted means of some of the treatment groups; so the null hypothesis was rejected in case of both the samples, rural and urban.

2. The following treatment groups show statistically significant differences:

(a) Linear Supervised and Linear Non-supervised. (The

(Linear Supervised Treatment is superior in both rural and urban samples).

(b) Branching Supervised and Linear Non-supervised treatment in both the samples, Branching Non-supervised being significantly better than Linear Non-supervised.

(c) Braching Non-supervised and Linear Non-supervised treatment in both the samples, Branching Non-supervised being significantly better than Linear Non-supervised treatment.

3. The following treatment groups do not show statistically significant difference at any level:

(a) Branching Supervised and Branching Non-supervised.

(b) Branching Supervised and Linear Supervised.

(c) Branching Non-supervised and Linear Supervised.

CONCLUSIONS

On the basis of the analysis and interpretation of the data, the following specific conclusions can be drawn.

1. *Programming Style*

As there is no significant difference between the Linear Supervised and Branching Supervised treatments in both the samples, rural and urban, it can be concluded that as far as geography (which involves the learning of concepts, generalizations and discriminations) is concerned both linear and branching styles are equally effective. The finding of this experiment confirm the results of Roe and others (1960) and Larkin and Leith (1969), who also could not establish any significant difference between the linear and branching styles.

2. *Supervised and Non-supervised Situations*

(a) *Linear Programme under Non-supervised Situations.* There is a significant difference between the Linear Supervised and Linear Non-supervised treatments in both the samples and the Linear Non-supervised treatment is found to be less effective. The findings of this experiment confirm the results of the studies of Ree (1962), Bartz and Charles (1965), but not of Ryan (1969) and Gotkin (1964). The views of Fry (1963) seem to be supported by this experiment:

that manipulation of the programme and cheating, the possibilities of which are greater in the non-supervised situation, have a definite bearing upon the quality of learning.

It can therefore be concluded that for effective results on the linear programme, supervision by the teacher is desirable.

(b) *Branching Programmes under Non-supervised Situations.* In the case of branching programmes it is found that there is no significant difference between the supervised and non-supervised treatments in both the samples. So it can be concluded that branching programmes are equally effective in both supervised and non-supervised situations. The absence of the teacher does not adversely affect the level of performance of the student. This finding supports the claim put forth by the Crowderians that branching programmes have internal control over cheating.

Within the limits of this experiment it can be concluded that, if programmes are to be given under non-supervised situations, the branching programmes are a better choice compared to linear programmes.

3. *Rural and Urban Settings*

Though the collection and analysis of the data of rural and urban samples were done separately, it was not considered desirable to compare these data statistically because of the small sample. However, the overall comparison of the adjusted means of the four treatment groups of urban and rural samples are shown in the table below.

TABLE 7

Comparison of the Adjusted Means of Rural and Urban Samples, Treatment-wise

Treatment	*Adjusted Means* Rural	Urban	*Difference*
Linear Supervised	27.05	24.71	2.34
Linear Non-supervised	24.65	21.84	2.81
Branching Supervised	27.64	23.87	3.87
Branching Non-supervised	26.89	24.70	2.19

The above table shows that the level of achievement of the students from rural areas is slightly higher than the students from urban areas in all the treatment groups. Nothing can be concluded with confidence regarding this difference; but it can at least be hazarded that if programmes are given to the students of rural areas they will work at least as effectively as students in the urban areas.

If we compare the rank-order of different treatment groups, we find a slight difference though it is not significant statistically as shown in the table below.

TABLE 8

Ranks of the Four Treatments According to the Adjusted Means of Criterion Test

Treatment	*Rank in Urban Sample*	*Rank in Rural Sample*
Linear Supervised	I	II
Linear Non-supervised	IV	IV
Branching Supervised	II	I
Branching Non-supervised	III	III

In the urban sample, the Linear Supervised treatment stands first whereas in the rural sample the Branching Supervised treatment is first in rank-order. The Linear Non-supervised treatment is lowest in order, in both samples.

Thus, it can be concluded that programmed learning material can be used in rural schools too.

The conclusions of this study are briefly as follows.

1. Supervision is necessary for linear programmes.
2. In non-supervised situations, branching programmes are more effective than linear programmes.
3. Both linear and branching programmes can be prepared in the subjects like geography.
4. The programmed learning material can be used both in urban and rural schools.

SUGGESTIONS

1. For a wider application of programmed learning material,

especially for the adult learners, programmes in branching styles should be developed for use in the non-supervised situation, specially in the subjects like geography which involve concepts, generalizations and discriminations.

2. Since we cannot use teaching machine, it is suggested that when linear programmes are given to the students for reading the teacher should supervise them.

3. The programmed learning material should be introduced in rural areas too. Its need is all the greater because rural schools suffer from the lack of trained and qualified teachers and the students in rural areas do not have self-study habits and are less motivated.

Further researches in this area can be undertaken on the following aspects.

1. The relative effectiveness of linear and branching programmes may be studied in terms of speed and power of retention.

2. The linear and branching programmes may be developed in different subject areas involving skills, facts, information as well as concepts and generalizations, and their relative effectiveness may be found.

3. More studies may be undertaken to compare the relative effectiveness of lienar and branching programmes, with reference to the other variables like self-study habits of students, their attitude towards the subject, their scholastic achievements in general as well as in the particular subject, their level of motivation, and other personality characteristics.

4. Some more studies can be undertaken in order to study the effectiveness of programmed learning material in other non-supervised situations like correspondence courses, home-study, etc.

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A Comparative Study of the Dependency, Class Trust and Initiative Levels of Pre-Adolescent Students of Delhi, Calcutta and Coimbatore

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The development of a battery of Pre-Adolescent Personality tests by a team of researchers, of whom the author was one, was reported in this journal earlier (July 1970). Subsequently they reported in this journal (January 1972) the results of a survey conducted among fifth grade children of Delhi, Calcutta and Coimbatore, using the Pre-Adolescent Adjustment Scale. Now the author discusses the results of the survey on the remaining three tests of the battery, which measure dependency, class trust and initiative.

In an earlier article published in this journal, Pareek *et. al* (1970) have reported the development of a battery of Pre-Adolescent Personality tests which included the Pre-Adolescent Adjustment Scale (PAAS), Pre-Adolescent Classroom Trust Scale (PACTS), Pre-Adolescent Initiative Questionnaire (PAIQ) and a Pre-Adolescent Activity Level Scale. In a subsequent article published in this journal, the author has reported the comparative results of a survey conducted among fifth grade children of Delhi, Calcutta and Coimbatore using the Pre-Adolescent Adjustment Scale. The present paper is intended to present the results of the survey on the remaining three tests.

DEPENDENCY

Dependency in this study was defined as "the tendency to seek the help of others in making decisions or in carrying out difficult actions." (English and English, 1958). Tests developed on dependency, reviewed before the development of PADS in this study, include tests framed by Sears (1963), Vroom (1959), Amidon (1959), Flanders, Anderson and Amidon (1961), and (in India) by Sinha (1968).[1] The dependency scale has two parallel forms, Form A and Form B, with the parallel-form reliability coefficients being .36, .43 and .84, respectively, in three schools. Each form contains 10 items evenly distributed between 'dependency' and 'independence'. Scoring in Form A is by three-point scale system. Each item is followed by three response alternatives (always or mostly, sometimes, never or rarely). Dependency items are scored 2, 1 and 0 for 'always', 'sometimes' and 'never', respectively; this scoring gets reversed for 'independence' items. The total score may be between 0 to 20, with 20 representing the highest dependency and 0 representing the highest independence, and scores around 10 representing mixed feelings of dependency and independence.

Items in Form B have different scale values depending on the intensity of the dependency or independence feelings they measure. Dependency items have positive scale values and independence items have negative scale values. The total score of an individual is the sum of the scale values of the items he checks, which may range from —15 through 0 to +15. Positive scores indicate dependency, and negative scores, independence, while scores around 0 may indicate mixed reactions. These tests take about 10 to 15 minutes for administration.

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[1] For a detailed review of literature on the variables measured by this study and the devlopment of the tests please refer to Pareek, *et al* (1970) and Pareek and Rao (1971).

Sample

Form B was administered during 1970-71, to 558 Delhi children (drawn from 20 schools), 418 Calcutta children (drawn from 7 schools), and 486 Coimbatore children (drawn from 13 schools). The Bengali and Tamil translations of Form B were used in Calcutta and Coimbatore, respectively. The children from Calcutta were drawn from missionary and public schools.

Data Analysis

Means and standard deviations were calculated for the different schools as well as for the total sample. Only the total sample means and standard deviations are reported here. Details of school-wise means and item-wise percentages of responses given by these children are reported elsewhere (Pareek and Rao, 1971).

Results

The means and standard deviations of the different samples are given in Table 1.

TABLE 1

*Means and Standard Deviations of the Dependency Scores of Fifth Grade Children from Delhi, Calcutta and Coimbatore as measured by PADS**

	SAMPLE		
	Delhi (South) $N = 558$	*Calcutta* $N = 418$	*Coimbatore* $N = 486$
Mean	−4.19	−0.17	1.15
S.D.	4.43	4.67	4.59

*The t-ratio, calculated to test the significance of the differences between the mean scores of the three samples, showed that all the three differences were significant at .01 level.

From the table it appears that the Coimbatore children studied were significantly more dependent than the children from Calcutta who were in turn significantly more dependent and less independent than the Delhi children. While it is difficult to hypothesize any significant factors that are associated with the type of city, the results are definitely indicative of a significant trend of differences that exist in the dependency proneness of the children from the three cities. Another significant piece of information that needs to be mentioned at this point is that when Form A of PADS was administered about two years prior to this study to 1111 fifth grade children drawn from 50 schools of Delhi and New Delhi, the mean score obtained was 9.83, with 2.89 as the standard deviation. Keeping in view the shorter theoretical range of PADS-A (0 to 20) as compared to PADS-B, this score of Delhi students shows the weightage to be slightly more on the side of independence as against dependence. Item analysis of the scores on PADS-A in this study also revealed that the major area of dependence was with regard to parents and teachers, which is in line with the social norms of our culture. This also supported the finding of Gewritz (1956) that dependence towards adults has priority over dependent relationships with peers among school children. These earlier results also seem to have supported the hypothesis of Flanders (1960), which he formulated after a survey of literature on dependency, that each child develops a balance of dependence and independence that becomes well established during the preschool years. However it is not clear whether the significant trend towards more of independence observed in the South Delhi sample, as compared to the first sample of Delhi, is due to the area difference, or due to the differences in test formats (which is less likely as the parallel form reliabilities appear to be tolerably good), or due to the passage of time, or due to altogether different factors. Although carefully designed studies are required to test this, the result does point to a significant factor of geographical differences in dependency proneness.

While this is the picture as regards the differences between the samples of the three cities, school-wise differences in each city do reveal some consistent results. The mean scores of the South Delhi students on PADS-B ranged from 1.00 to –7.04, and their standard deviations ranged from 2.71 to 5.98. For the Calcutta schools the mean scores ranged from 1.06 to –2.0, and their standard deviations from 2.60 to 5.16. And lastly, for the Coimbatore students the ranges were –1.22 to 5.52 for the means of the schools, and from 2.97 to 5.39 for the standard deviations. While these indicate the fairly good amount of inter-school differences in the same city, these results are also clearly indicative of the inter-city differences.

CLASS TRUST

Classroom trust in this study is defined as the pupils' feeling free to interact with the teacher, to discuss with him the day-to-day classroom problems such as the teacher's actions not convenient to or liked by the pupils or the feelings aroused in the pupil by some actions of the teacher, and the pupils' voluntary help to the teacher in tackling some classroom problems.

A semi-projective test (Pre-Adolescent Classroom Trust Scale—PACTS) was used to measure the class trust of the students. This test consist of eight items, each describing a problem situation involving a teacher (or a peer member) and a student. Each item is followed by four alternative types of responses representing different degrees of trust, and the respondent is required to suggest what the student involved in the situation would do. It is assumed that in responding to the item the respondent projects his own ways of responding and answers the item. Depending on the response he chooses he may get any of the scores 4, 3, 2, or 1. The split-half reliability of the test is .814 (based on 219 respondents) and the test-retest reliabilities ranged from .33 to .77, with a gap of 14 weeks between administrations.

Sample

The test was administered on about 1,700 fifth grade children drawn from 50 schools of Delhi. After rejecting the incomplete blanks a total of 1,365 protocols were retained for final analysis. This sample was drawn from both Delhi and New Delhi schools and was tested in 1969. The rest of the samples were tested during 1970-71. The samples from Delhi and Coimbatore were the same as for PADS. The Calcutta sample consisted of 312 *Ss* as some protocols were rejected.

Data Analysis

Means and standard deviations were worked out for the total sample. School-wise means and standard deviations as well as item-wise response percentages are reported elsewhere (Pareek and Rao, 1971). t-ratios were worked out to test the significance of the differences between the Delhi, Calcutta, and Coimbatore samples.

Results

Means and standard deviations of the four samples of children from the three cities are given in Table 2. A cursory look at Table 2 reveals that classroom trust in Calcutta children is the highest, followed by the Delhi pre-adolescents, the Coimbatore children being the last in class trust. Keeping in view the theoretical range of scores from 8 to 32, the scores of the Calcutta children indicate a high level of trust, both at an absolute level and at a relative level. This trend in Calcutta could again be attributed to nature of the sample as the *Ss* were drawn from missionary and public schools. Perhaps if the sample had been drawn from government schools it might have revealed altogether a different picture.

TABLE 2

*Means and Standard Deviations of the Scores on PACTS for the Fifth Grade Children from Delhi, Calcutta and Coimbatore**

	Delhi I *N=1366*	*Delhi II* *N=558*	*Calcutta* *N=312*	*Coimbatore* *N=486*
Mean	22.07	22.11	25.10	16.41
S. D.	3.22	3.14	2.99	10.63

*t-ratios were not significant only for the difference in means between the two Delhi samples. All the rest of the differences were significant.

The school-wise means of all these seven Calcutta schools were high, ranging from 24.61 to 26.33, and their standard deviations ranged from 1.63 to 3.90. The 13 Coimbatore schools had their mean scores ranging from 10.11 to 23.90, with their standard deviations ranging from 2.55 to 12.21. The mean scores of these schools as well as the standard deviations were widely spread. The means of the Delhi schools (both samples) were found to be 18.54 and 25.18, with most of them around 21 and 23. The standard deviations ranged from 2.06 to 3.89. These observations indicate strikingly that, except in the Coimbatore sample, inter-school as well as intra-school differences are very low and that it is the city (and may be the nature of the school—missionary vis-a-vis, Government, as in Calcutta) for which differences could be found.

INITIATIVE

Initiative in this study was defined as "the tendency to start actions independently with or without involving originality." The final test to measure initiative consists of a six-item open-ended questionnaire—the Pre-Adolescent Initiative Questionnaire (PAIQ). PAIQ is also a situational test containing six different situations in which six different students are faced with different problems. The respondent is asked to guess what the student in the given situation does in response to the problem he faces. The scoring system was developed after the content analysis of the responses of a number of pre-adolescents. The final scoring system assigns the scores 3, 2, 1, 0, depending on the amount of initiative reflected in each answer. A scoring manual is given elsewhere (Pareek and Rao, 1971). The scores may range from 0 to 18. Test-retest reliabilities worked out from the retest data in three schools (14 weeks gap) are .50, .55 and .66. Inter-scorer reliabilities range from .83 to .90.

Sample

The final sample of students whose protocols were retained in the first testing at Delhi (from the 1,700 students tested in Delhi during 1969) was 14.25. The sample of children studied during 1970-71 from South Delhi, Calcutta and Coimbatore was same as the earlier sample.

Data Analysis

Means and standard deviations, school-wise as well as for the total samples of each city, were calculated and t-ratios were computed to test the significance of the inter-city differences in the mean scores.

Results

The means and standard deviations of the four samples are given in Table 3. The table presents a picture of high initiative levels of the Delhi samples over the other two samples. The mean scores of the Delhi schools ranged from 6.10 to 16.33, with the SDs ranging from 2.86 to 4.95. The mean scores of the Calcutta schools ranged from 5.83 to 12.45, with the SDs ranging from 2.81 to 5.06. For the Coimbatore *Ss* the ranges were from 4.48 to 13.22 for means, and from 2.12 to 4.71 for the standard deviations. These results are indicative of a relatively high level of initiative-taking behaviour in Delhi children.

TABLE 3

*Means and Standard Deviations of the Scores on PAIQ for Fifth Grade Children from Delhi, Calcutta and Coimbatore**

	Delhi I *N=1425*	*Delhi II* *N=558*	*Calcutta* *N=312*	*Coimbatore* *N=486*
Mean	10.44	10.69	8.82	8.59
SD	4.61	4.25	4.65	4.59

*Mean differences between Delhi (1 & 2) and Calcutta as well as Delhi (1 & 2) and Coimbatore are significant at .01 level as revealed by the t-ratios. The rest of the differences were not significant.

SUMMARY AND IMPLICATIONS

This study on fifth-grade children from the cities of Delhi, Calcutta and Coimbatore reveals that an average fifth-grade child from Delhi schools is likely to be more independent and initiative-taking than an average fifth-grade child from Coimbatore or from Calcutta (missionary schools). With regard to the amount of trust he has towards his teacher and friends, although he seems to be lagging behind his counterpart from Calcutta, he is far superior to his counterpart from Coimbatore. The findings reported in the previous paper in this connection seem to tally very much with these observations (Rao *et al*, 1972). The earlier findings revealed a similar picture with regard to the children's adjustment towards the teachers; the Calcutta students were well adjusted towards their teachers as compared to Delhi and Coimbatore students, among whom the Delhi students were better. The relatively low level of independence and initiative in Calcutta children and Coimbatore children does give some clue as regards the cultural and environmental influences exerted on the personality development of these children. As in the earlier study the current study also revealed inter-school as well as intra-school differences in the three variables, besides inter-city variations.

As pointed out in the earlier paper these results also have a variety of implications for the teachers and to the parents. Although many hypotheses could be formulated to explain these differences in the dependency, class trust and initiative levels of children, more data is required from different language groups, cities, rural schools and missionary schools to provide any reasonable insight into the differences shown by these children. It has been demonstrated beyond doubt by educational psychologists that trust in the teacher is essential for the student to develop positive attitudes towards the teacher and towards the subjects he teaches. In fact the teacher is a major influencing source in creating a set in the student to learn, and a set to learn is difficult to be established by a teacher to whom the students are afraid to talk, and whom they trust less. It is quite likely that the teacher produces such feelings in the students unknowingly by creating interactions like criticizing them, directing them, and bossing over them in his over-enthusiasm to help them. These students are sensitive enough to his interactions and perhaps not to his intentions.

Independence and initiative are two variables which are highly desirable in the youth. The high independence shown by Delhi students and the dependence shown by Coimbatore students is in the expected direction in view of the nature of the two cities with regard to the type of interaction they permit between the student and his parents, teachers, friends, etc. In a city like Delhi the interactions are perhaps less between the students and their parents, leaving a lot of freedom for the child to choose his activities (as there is little supervision) whereas in a place like Coimbatore, where the life is not as mechanized as in Delhi, perhaps there is a lot more scope for parents and teachers to over indulge in the activities of the child, thus making him more dependent. If this hypothesis is true we may expect rural children to be more dependent than urban children, although there are many other intervening variables. Also, how much of independence is desirable at this stage is another question that requires to be answered by educationists. Research on dependency is required on these lines to answer questions like: What is the intelligence level of the less dependent children? How are they in their school achievement? What are their attitudes towards the teacher? And so on. Answers to these questions can make dependency studies more meaningful.

The picture is more clear with regard to initiative, in view of the high desirability of this trait. Researchers on this variable are required to answer questions like: What is the role of the teachers and parents in making children take more initiative? What kind of adult personalities do these high initiative-taking children form into? Is initiative-taking a significant variable in influencing school achievement? And so on. Such answers can go a long way in opening new dimensions of educational psychology.

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Play Preferences of Nursery School Children

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Adequate play equipment is necessary for the efficient functioning of the nursery school as much of the preschooler's learning takes place through well-conceived games, but very often nursery schools buy play equipment on the basis of certain established stereotypes. We do not know how much use children make of particular pieces of play equipment. The authors therefore undertook this study to find out children's play preferences, and whether it is necessary for a nursery school to go in for the traditional kinds of equipment.

Nursery school education has gained some importance in the recent years. Research has shown that the preschool years are crucial years for the child's development and that stimulation or deprivation during these early years exercises the maximum effect on the child's later development. (Bloom, 1964). This evidence has woken up many nations and has resulted in their starting a large number of preschool programmes all over the world. The Head Start projects of the U.S.A., the Play Groups of the U.K., etc., are some examples.

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Plowden in her report on primary education argued strongly for the increase of preschool facilities in England. In India too one finds now an increasing concern for the young child. Some time ago the Government of India appointed a number of committees to study and suggest programmes for preschoolers. The nutrition programmes for preschoolers, the *balwadis* for the young ones, etc., are some of the results of this concern.

At this stage when we in India are beginning to be aware of the significance of early childhood and are making some budgetary provisions for the stimulation of the preschooler, it is certainly necessary to know more about the young child. In nursery schools, much of the stimulation is done through play. Adequate play equipment is necessary for the efficient functioning of the nursery school as much of the preschooler's learning takes place through well-conceived games. Very often nursery schools buy play equipment on the basis of certain established stereotypes. Little do we know how much children make use of these pieces of play equipment and whether it is necessary to go in for the traditional kinds of equipment. The present study has attempted to find out about the child's play preferences.

Objective

The objective of the investigation was to make an exploratory study of the play preferences of nursery school children.

Sample

The sample consisted of 68 children attending a nursery school in Delhi. The *Ss* were drawn from three classes of the nursery school: junior nursery, senior nursery and kindergarten. The mean ages for the three groups, respectively, are: 4 years, 2 months; 4 years, 8 months; and 5 years, 2½ months. The *Ss* were drawn from all types of socio-economic strata.

Table 1 gives the distribution of the sample.

Procedure

The school programme is such that daily a period of 45 minutes

TABLE 1

Class	*Boys*	*Girls*	*Total*
Junior Nursery	10	6	16
Senior Nursery	9	14	23
Kindergarten	15	14	29
Total	34	34	68

each is set apart for indoor as well as outdoor free play. The teacher was required to observe the children at play and note the pieces of equipment with which they played. The observation was done continuously for five days, and thus the total time for which the children were under observation was 225 minutes. During this period the children were free to play with anything that was available.

The types of play equipment provided for the outdoor free play were the same throughout the year. These were: slide, sand pit, jungle gym., seesaw, nesting frame, ball, ring, low walls for walking and running, and holes in the walls for sitting and chatting or hiding. The swing was not provided as it was broken. The same pieces of play equipment were provided to all the three classes.

As regards indoor free play, the play equipment was changed once a week. However, it was ensured that all the play activities were presented in the course of two weeks. A set of nine activities were presented in the second week to the children of the junior and senior nursery classes. The activities presented in the first week were: beads, big and small blocks, paper-cutting, crayon-drawing, picture books, picture puzzles, water-play and doll-play. In the second week the activities presented were: clay, collage, brush-painting, magnet, magnifying glasses, materials for sorting (varieties of grains and pulses), road-building blocks and button frames. For the kindergarten group, additional constructive materials (multi-moons, cog-wheels, etc.) and thread and needle and number cards were given in the place of magnet, magnifying glass and sorting materials. The button frame also was not given to the older group, and as such the older children were given only fifteen activities as against the sixteen given to the other groups. It should be noted that all these activities were part of the regular routine of the school and effort was taken to see that no new activity was introduced at the time of the study and that the element of novelty did not affect the results of the study.

Scoring and Analysis

For purposes of quantifying the preferences, a preference score of 1 was given to the play equipment if a child made use of it any time during the freeplay period under study. The scores thus given were totalled up for all the five days for all the children, and this yielded the total preference scores. These total preference scores were then ranked. The higher the preference score, the greater the play equipment was liked and played with by children. Rank-difference-method correlations were then worked out to study the sex differences and class differences in play preferences.

Results

Table 2 gives the total preference score for outdoor play and the rank for each type of play activity for all the three groups.

TABLE 2

Play Equipment	*Junior Nursery*				*Senior Nursery*				*Kindergarten*			
	Boys		*Girls*		*Boys*		*Girls*		*Boys*		*Girls*	
	S	*R*	*S*	*R*	*S*	*R*	*S*	*R*	*S*	*R*	*S*	*R*
Slide	18	2	18	2	19	1	29	2	30	2	11	4.5
Sand Pit	23	1	23	1	16	3	32	1	25	1	37	1
Running on Walls	10	5.5	5	4	10	5	20	3	17	3	17	3
Sitting in Holes	12	3	1	6.5	12	4	19	4	2	9	11	4.5
Jungle Gym.	11	4	3	5	1	8.5	7	6	9	7	9	6.5
Ball	6	7	0	8.5	8	6	2	9	15	4	6	8
Ring	2	9	0	8.5	5	7	5	7	12	6	1	9
Seesaw	10	5.5	1	6.5	1	8.5	3	8	6	8	9	6.5
Nesting Frame	5	8	8	3	17	2	16	5	13	5	22	2

Table 2 shows that by and large the most popular pieces of play equipment are the slide and the sand pit. Another favourite equipment is the nesting frame. The least popular are generally the ball, ring and seesaw. The jungle gym. is also found to be not so popular except perhaps with the youngest group which is found to play a little with it.

Table 3 gives the rank-difference-method correlation of the outdoor play preference scores of boys and girls in the three groups.

TABLE 3

Groups	*Correlation between Boys and Girls*	*Level of Significance*
Junior Nursery	.88	01
Senior Nursery	.72	.05
Kindergarten	.48	Not significant

Table 3 thus shows that the outdoor play preferences of boys and girls are significantly correlated in the junior and senior nursery classes but not in the kindergarten. In other words no significant sex differences are noted in outdoor free play in the case of the younger groups, but in the kindergarten class the order of preferences is different for boys and girls.

Table 4 gives the rank-difference-method correlations of the outdoor play preference scores of the three groups, sex-wise.

TABLE 4

Groups	*Boys*	*Girls*
Junior Nursery	.36	.86**
Senior Nursery	.58	.81**
Kindergarten	.30	.88**

**Significant at .01 level

Table 4 shows that amongst boys, no significant correlations are noted in the order of play preferences of the three classes. They appear to have different patterns of play preferences in the three groups. However, as regards girls the case is different. Their play preferences in the three groups are highly correlated. In other words, they have more or less the same play preferences in the three groups.

Indoor Free Play

Table 5 gives the total preference scores for the indoor free play activities, and the rank for each, for all the three groups.

TABLE 5

Play Activities	*Junior Nursery*				*Senior Nursery*				*Kindergarten*			
	B		*G*		*B*		*G*		*B*		*G*	
	S	*R*	*S*	*R*	*S*	*R*	*S*	*R*	*S*	*R*	*S*	*R*
Beads	11	13	5	13.5	12	10.5	19	10	34	1	23	3.5
Big and Small Blocks	19	4	11	6.5	14	9	17	12	5	12	3	11.5
Paper-cutting	17	6	21	3	20	4	39	2	7	9	4	10
Crayon-drawing	20	2.5	30	1	24	2.5	41	1	3	13	10	9
Picture Book	16	7.5	10	9	19	5.5	12	13	9	7.5	3	11.5
Picture Puzzle	13	9.5	8	12	2	15	6	16	32	2	15	7
Water Play	13	9.5	9	11	19	5.5	30	5	6	10.5	0	14
Doll Play	5	16	2	15	1	16	7	15	9	7.5	29	1
Clay Work	12	11.5	13	4	8	12	18	11	27	3.5	16	6
Collage	16	7.5	26	2	12	10.5	34	3	16	6	13	8
Brush Painting	9	14	10	9	25	1	32	4	27	3.5	27	2
Magnet/Construction Materials	29	1	12	5	17	7	29	6	22	5	20	5
Magnifying Glass/ Thread and Needle	18	5	10	9	6	13	9	14	6	10.5	23	3.5
Sorting Number Cards	8	15	5	13.5	4	14	23	7	1	15	0	14
Road-building Blocks	20	2.5	1	16	24	2.5	22	8	2	14	0	14
Button Frame	12	11.5	11	6.5	16	8	21	9				

Table 5 gives the total preference score for the indoor free-play activities and their ranks for all the three groups. It should be noted that the magnet, magnifying glass, materials for sorting and button frame were not given to the kindergarten group. The kindergarten activities, on the other hand, included constructive materials, thread and needle and number cards, which were not given to the younger groups. These activities obviously could not be given to the younger groups as they require more muscular coordination. The special activities given to the younger groups could not be included for the kindergarten children only because they did not form part of the regular routine and as such might draw more attention from the children. As a result, the rank-order correlation of play preferences could be worked out only between the play preferences of the senior and junior nursery children. The kindergarten group had to be treated separately.

Table 5 shows that the most popular play activities (the first five play preferences) are as follows.

Junior Nursery

Boys: Magnet, road-building blocks, crayon-drawing, big and small blocks, magnifying glass.
Girls: Crayon-drawing, collage, paper-cutting, clay work, magnet.

Senior Nursery

Boys: Brush-painting, road-building blocks/crayon-drawings,[1] paper-cutting, picture book/water play.
Girls: Crayon-drawing, paper-cutting, collage, brush-painting, water play.

Kindergarten

Boys: Beads, picture puzzle, clay work/brush-painting, constructive materials.
Girls: Doll play, brush-painting, beads/thread and needle, constructive materials.

Table 5 also shows that the least popular play activities (the last five ranks) are as follows.

Junior Nursery

Boys: Doll play, sorting, brush-painting, beads, clay work/button frames.

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[1] The oblique sign is used whenever two activities get equal ranks.

Girls: Road-building blocks, doll play, beads/sorting, picture puzzle.

Senior Nursery

Boys: Doll play, picture puzzles, sorting, magnifying glass, clay work.

Girls: Picture puzzles, doll play, magnifying glass, picture book, big and small blocks.

Kindergarten

Boys: Number cards, road-building blocks, crayon-drawing, big and small blocks, water play/thread and needle.

Girls: Water play/number cards, road-building blocks, big and small blocks, picture books.

Table 6 shows the ranks-difference-method correlation of the indoor free-play preference scores of boys and girls in the three groups.

TABLE 6

Groups	*Correlation between Boys and Girls*	*Level of Significance*
Junior Nursery	.39	Not Significant
Senior Nursery	.67	.01 level
Kindergarten	.68	.01 level

Table 6 shows that it is only at the junior nursery level that the patterns of indoor-play preferences are different for boys and girls. At both senior nursery and kindergarten levels, they are highly correlated and as such no sex differences are found to exist.

Table 6 shows the ranks-difference-method correlation of the indoor free play preference scores of the two groups, sex-wise.

Table 7 shows that the indoor free play preferences of boys in the junior and senior nursery are not significantly correlated and as such they are not different for the two groups. On the other hand,

TABLE 7

Groups	*Boys*	*Girls*
Junior Nursery Senior Nursery	.45	.52*

* Significant at .05 level

they are significantly correlated for girls, which shows that no significant difference exists in the play pattern of the two groups.

Discussion

The pattern of play preferences shown by the three groups of children reveal something about the selection of play equipment for the nursery school. The most popular pieces of outdoor play equipment are the slide, the sand pit and the nesting frame. Children have also been found to like running on low walls or sitting and chatting in private hide-outs (holes). In contrast, they do not seem to care much for balls, rings, seesaw or jungle gym. However, these equipments are accepted to be the traditional pieces of outdoor play equipment for a nursery school. They are expensive ones, particularly the seesaw and the jungle gym. However, the data show that no harm will be done if they are not included in the play equipment of a nursery school.

As regards indoor play activities, one of the most surprising results is the lack of preference for dolls. Dolls are generally considered to be the favourite toy of young children and every good nursery school provides varieties of dolls, dolls' costumes, doll corners, etc. The present data, however, show that they are one of the least liked play activities for both the younger groups. It is only in the case of the girls in the kindergarten class that doll-play figures as one of the most popular play activities. Crayon-drawing is found to be popular with the younger groups but brush-painting is more popular with the kindergarten group. Block play is popular with boys of the younger age-groups whereas paper-cutting and collage work are more liked by the younger girls. Like the dolls, threading the beads and sorting materials are not found to be liked by the younger groups. Picture puzzles are also not much liked by the younger children. In the kindergarten class one finds that number cards are hardly made use of by children. However, threading the beads and sorting materials are good activities for the finer muscle development of young children; similarly, number cards are useful to develop concepts of number in older children. It appears that teachers should try to devise interesting games with these materials if they want the children to make use of them.

The pattern of outdoor play preferences remains generally the same in the case of boys and girls in the younger groups, whereas the kindergarten group shows sex differences. In indoor free play, on the other hand, the sex difference in play preferences is noted only in the junior nursery class. The trend in outdoor free play is understandable as it is to be expected that sex differences in play become more significant as children grow older. But the trend in indoor play is not clear. The sample of girls in the junior nursery was very small and the sex differences at this level may perhaps be only because of this factor. However, this needs further probing.

The pattern of outdoor play preferences is not found to be correlated in the boys of the three groups whereas in the girls it is highly correlated. In other words, girls are found to have more or less the same order of preferences, but with boys it differs from class to class. This is found to be true of indoor free play too. The order of preferences is significantly correlated for the girls of senior and junior nursery classes but not so for the boys. The kindergarten children could not be compared as the play activities offered to them were different. Maturational differences should normally have been noticeable in both the groups but the reason why they are seen in the case of boys and not in that of girls is not clear. Could it be that the boys generally take more interest in play activities and as such may try to explore more possibilities and equipment than girls who may be satisfied with continuing the same favourite games? One is not certain of the answer.

Conclusions

1. The most popular pieces of outdoor play equipment are found

to be the slide, sand pit and nesting frames, whereas the least popular ones are generally the ball, ring, seesaw and jungle gym.

2. Some of the most popular indoor free play activities are found to be crayon-drawing or brush-painting. Block play is found to be popular with the younger boys, whereas the younger girls in the senior and junior nursery classes like to do paper-cutting and collage work. Beads and constructive materials are found to be popular with the kindergarten boys and girls.

Dolls, beads, picture puzzles and sorting materials are found to attract very little attention in the younger groups. Similarly, in the kindergarten group, number cards, blocks and water play arouse the very minimum of interest.

3. Sex differences are noted in outdoor play preferences only in the kindergarten group, whereas in indoor play they are noted only in the junior nursery class.

4. The pattern of outdoor play preferences of the girls of the three groups—junior nursery, senior nursery and kindergarten—is found to be highly correlated. However, in the case of boys, the pattern of preferences is different.

5. The trend is the same in indoor free play too. In the case of girls in the senior and junior nursery classes, the play preferences are correlated, but in the case of the boys they are not.

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Non-cognitive Characteristics of Over- and Under-achievers : A Review of Studies

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The author reviews significant studies on non-cognitive characteristics of deviant achievers under three broad heads: personality-temperamental, interest-motivational, environmental-biographical. He concludes that the investigations conducted so far do not lead to any confident generalization regarding the non-cognitive syndromes of achievement discrepancy and stresses the need for further research.

Attainment in education is generally believed to be dependent on one's aptitude or the capacity to learn. In fact, there are numerous experimental studies to confirm this belief. All such studies have invariably produced a positive correlation between aptitude and academic achievement. And because of this relation, many educational institutions prefer to use an aptitude test for the selection of their students. Clearly, the assumption is that pupils earning higher scores on the aptitude test will perform better in the subsequent academic situations; here the aptitude scores are used as a predictor of academic performance. This approach would have been all right if the aptitude and the achievement scores had been perfectly correlated and correct predictions made in all cases. But unfortunately, none of the reported studies indicates a perfect correlation between the two. As a result, predictions based on the aforesaid correlations are not correct in many cases. This imperfection is explained by: (i) instrumental errors in the tests of aptitude and achievement, (ii) erratic behaviour of the students during the test-taking situation(s).

The means available at present to obviate the first difficulty is to select tests (both aptitude and achievement) of high reliability and validity. The second difficulty can be removed by identifying the erratic performers and excluding them from the sample (Farquhar and Payne, 1964). But even with these measures, the aptitude-achievement correlation cannot be raised to perfection; the residual gap is now supposed to be caused by a real discrepancy between the aptitude and the achievement of a section of students. They are not included in the group of normal achievers since their achievement is not in accord with their aptitude. These students are called discrepant or deviant achievers and the phenomenon is known as 'achievement discrepancy.' Unlike the erratic performers, the discrepant achievers are quite serious and well motivated in their test-behaviour but for some reason or the other they do not achieve according to expectation.

Achievement discrepancy may be of two kinds. For some students, the actual achievement is higher than the expected achievement as predicted from their aptitude scores; on the other hand, there are some others whose actual achievement is lower than their predicted achievement. The first group is called the over-achievers and the second group the under-achievers.

During the last twenty-five years educators have been trying to understand this problem of over-achievement and under-achievement in schools and colleges. Their chief concern has been to know why some students should exceed the expected performance and some others should fall below the expectation. In this effort the investigators have tried to explore the different non-cognitive characteristics of the deviant performers, since their achievement patterns cannot be fully explained by their intellectual capacity alone, i.e., intelligence or aptitude test scores.

Quite a large number of non-cognitive characteristics have been examined for the purpose. For convenience, we can describe them under three broad heads: personality-temperamental, interest-motivational and environmental-biographical. Experiments have been conducted on different samples with different designs and different variables. In fact, a voluminous literature has developed on the subject. But what is the net result?

The present paper, by way of review of some important studies on the relation between the different non-cognitive variables and achievement discrepancy, tries to report the current state of knowledge regarding the syndromes of over and underachievement. The review, it is hoped, will be of some help to future workers and also to educators facing the problem of achievement-lag in schools and colleges.

Personality and Temperamental Variables

In this area four traits have been very frequently considered. These are anxiety, neuroticism, introversion-extroversion and adjustment. But none of them appears to have a consistent relation with achievement-discrepancy and no distinct pattern can be made out from the work conducted in the field. Thus Burgess (1956) found no difference in the anxiety index for the over- and the under-achieving groups. Holland (1960) noted that only the high-achieving girls were characterized by lack of tension and that the result was not valid for boys. According to Endler (1960), anxiety had no direct and significant relation with academic achievement but where the subjects were trichotomized into high-, middle- and low-achieving groups, anxiety was found to increase the correlation between the predicted and the actual grade averages for the high-achieving group and to decrease the correlation for the middle and the low groups. In Spielberger's study (1962) anxiety was found to facilitate the academic achievement of the higher ability group only. Malnig (1964) noted that anxiety was responsible for greater variability in academic performance, and that too for the high-achieving group only.

Neuroticism, which is another personality variable studied in connection with achievement discrepancy, shows a similarly conflicting result. For investigators like Eysenck (1957), Lynn (1959), Lynn and Gordon (1961) good educational attainment was facilitated by neuroticism. But according to Savage (1962), academic achievement and neuroticism were negatively related. A similar study conducted in India by Mohanta (1965) suggested that high achievers were, in general, less neurotic.

Regarding introversion-extraversion, Altus (1948) and Child (1964) noted that the high achievers were characterized by introversion and the poor achievers by extraversion. Lynn (1959), Lynn and Gordon (1961), and Savage (1962) related extraversion with lack of concentration for academic work. On the contrary, Holland (1960) concluded from his study that high-achieving girls were usually extraverted; however, no such result was observed for boys.

Adjustment as a personality variable has been studied in different contexts: academic, emotional and social. Thus Borrow (1947) obtained a significant but low correlation between academic adjustment and achievement. Altus (1948) and Hoyt and Norman (1954) noted that emotional maladjustment was a characteristic of the low-achieving students. Similarly, Berger and Sutker (1956) found academic achievement to be positively correlated with emotional adjustment. Arnholter (1956) reported a significant difference between the personality adjustment of those who continued and those who dropped out of the secondary school. To Hackett (1960) social adjustment, and to Childers (1964), personal adjustment were contributors to academic achievement. On the other side, the studies of Griffiths (1945), Anderson and Spencer (1963), and Engel (1965) did not indicate any relation between emotional adjustment and academic achievement.

Apart from these four characteristics, i.e., anxiety, neuroticism, introversion-extraversion and adjustment, some other personality variables are occasionally found to differentiate the two groups. Altus (1948) noted a reliable mean difference for the two groups on the Hypomania (Ma) Scale of the Minnesota Multiphasic Personality Inventory. Schofied (1953) obtained differences on the Hysteria (Hy), the Psychopathic Deviates (Pd) and the Schizophrenia (Sc) Scales. Similarly, Hewer (1956) obtained a difference on the Lie Scale (L), the Psycholpathic Deviate Scale (Pd) and the Hypomania Scale (Ma). Hackett (1960) presented two different personality patterns for the high- and the low-achieving subjects on the basis of MMPI scores. The high achievers were more interested in verbal activities, showed less projection, discriminated better, were less emotional and could tolerate tension. The low achievers, on the other hand, were emotionally more responsive to and intolerant of tension, and favoured projection as a defence. They also revealed an authoritarian personality.

Using Edward's Personal Preference Schedule, Gebhart and Hoyt (1958) discriminated the two groups on the needs for Achievement Order, Intraception, Consistency, Nurturance, Affiliation and Change. Krug (1959) found differences only on three needs—Order, Achievement and Edurance in task. With the Guilford-Zimmerman Temperament Survey, achievement fluctuation appeared to be linearly related to Restraint and Objectivity; but with a non-linear assumption, Restraint, Objectivity, Friendliness and Masculinity were found to be related to this fluctuation (Bendig and Sprague, 1954). Again, using the same inventory, Watley and Merwin (1964) obtained differences on Restraint and Thoughtfulness only.

Hunt (1961) used the California Personality Inventory and obtained a difference on Psychological Mindedness (Py) between the over-achieving and the under-achieving males, but for the corresponding female groups differences were noted on Dominance (Do), Tolerance (To), Achievement via Conformance (Ac), Responsibility (Re), Good Impression (Gi) and Achievement via Independence (Ai). Flaherty and Rentzel (1965) observed differences on the scales of Dominance (Do), Capacity for Status (Cs), Sociability (Sy), Self-acceptance (Sa), Responsibility (Re), Tolerance (To), Achievement via Conformance (Ac), Achievement via Independence (Ai), Intellectual Efficiency (Ic) and Femininity (Fe). In all scales the high-achievers had higher scores.

Wright (1955) succeeded in predicting under-achievement by means of the scales of the Junior Senior High School Personality Questionnaire. Butcher, *et. al.*, (1963) using the same tool observed that thirteen variables of the questionnaire were correlated with academic achievement. Riddling (1967) noted significant differences between over- and under-achieving students on three scales of this questionnaire, viz., dominance, surgency and conscientiousness.

Some investigators used projective tests to study the personality differences of the two groups of discrepant achievers. Burgess (1956) applied the Thematic Apperception Test on over- and under-achieving students and concluded that the over-achievers were characterized by less labile affective responses, more constriction, inhibited emotional response to a pleasurable situation, greater intellectual control of emotion, more cautious approach to problems, greater needs for achievement and self-improvement. The under-achievers, on the other hand, tended to be less intellectually adaptive, showed over-generalization and over-extension of self, and had less control and repression of emotional reactivity. Morrison (1969) used the same test and noted that passive aggression probably stemming from strained adult-child inter-personal relations was associated with under-achievement.

Interest and Motivational Variables

To some investigators, interest has been an important non-cognitive factor connected with achievement variation. But a rather smaller number of studies appears to have been made in this area than in any other. To measure interest two inventories have been chiefly used, viz., Kuder Preference Record and Strong Vocational Interest Blank. Thompson (1944) noted that several components of the Kuder Preference Record were correlated with the achievement index. According to Frankel (1960), the inventory revealed distinct differences in the interest patterns of the over- and under-achieving groups.

Morgan (1952) used to Strong Vocational Interest Blank for measuring interest and reported some differences in the interest patterns of the two groups. Rust and Ryan (1954) observed that over-achievers differed from under-achievers on eleven scales and from normal achievers on twelve scales, nine of which were in common with the previous eleven. In Hewer's study (1956), the Blank did not produce any group difference for the over- and under-achieving students, but the score for occupational level was in favour of the over-achievers. Burgess (1956), however, did not find any differentiating pattern of interest for the two groups of deviant achievers.

The motivational factor considered in the studies of discrepant achievers has been described under various names—achievement motives, need for achievement, and sometimes, level of aspiration. The results obtained are as conflicting as the tools used are varied. Thus, Parrish and Rethlingshafer (1954) used the Thematic Apperception Test and observed that the achievers and non-achievers did not significantly differ on the need for achievement (*n*-Achievement). The same result was obtained even with two different scoring principles—one suggested by McClelland (1953) and the other developed by the investigators themselves. Red, McCary and Johnson (1962) used Cassell's Level of Aspiration Test and found that aspiration scores had an insignificant relationship with achievement. Backman's study (1964) suggested that the need-for-achievement scale was of little value in differentiating over- and under-achievers.

There are, however, reports of results where the motivational factor has been found to differentiate the two groups. Thus, according to Weiss, *et. al.* (1959), the motivation measure could be a useful predictor having a significant correlation with academic achievement. Gebart and Hoyt (1958) using the Edward Personal Preference Schedule observed that over-achievers scored significantly higher than the under-achievers on the need-for-achievement scale. Krug (1959) applied the same tool and obtained the same result. Harrill (1962) measured the level of aspiration through the self-estimates of academic performance and obtained a significant difference in the levels of aspiration of high and low achievers. The high achievers were found to underestimate their performance but low achievers tended to overestimate it. In India, Muthayya (1964) conducted a study on the same lines. He used the Thematic Apperception Test and McClelland's scoring procedure to measure the achievement motive and noted a significant difference in need-for-achievement scores of high and low scholastic performers. The high performers had higher *n* Achievement scores.

Environmental and Biographical Variables

It appears from a number of investigations that some environmental characteristics may also explain the discrepancies between aptitude and achievement. Thus, Campbell (1952) observed that certain aspects of the home background (socio-cultural aspects consisting of social activities, cultural objects in the home and the cultural values and attitudes of parents) greatly affected secondary school achievement. Kemp (1955) also found attainment to be related to socio-economic status. Klausmeier (1958) compared certain physical, behavioural and environmental characteristics of high- and low-achieving students and observed that two environmental factors were different for the two groups. One was the parental occupation and the other was the sex-ratio in the class. Duff and Seigel (1960) observed a 'negative relationship between effective utilization of academic ability on the one hand and degree of participation in physical, social and heterosexual activities on the other'. A group-wise breakdown of the results indicated that within the high-ability group over-achievers tended to conform more to social requirements and to participate more actively in religious activities, but less actively in aesthetic activities, than did the under-achievers. In the male group, the highest correlation was obtained between over-achievement by low-ability students and their participation in political and intellectual activities. In Frankel's work (1960), six factors were found to reveal differences for the two groups. These were: family and home background, socio-economic status, reaction to school subjects, reaction to school, out-of-school and leisure-time activities and vocational and college planning. Hunt (1961) tried to explore fourteen characteristics including age, parental education, number of elder brothers and sisters, number of younger brothers and sisters, age and occupational level of parent or guardian, etc. But none of these factors showed a significant difference between over- and under-achievers.

Dugan (1962) obtained a relation between the 'educational tradition' of the family and success at school. Street, Powell and Hamblen (1962) concluded that the larger schools tended to produce higher achievement levels. Roberts (1962) also observed that the two groups differed on a number of variables like parental education, parental age, health, birth order and parent-child relation. Childers (1964), on the other hand, failed to distinguish the two groups of achievers by means of socio-economic background variables. Similarly, Watson's attempt (1965) to predict achievement with the help of several (family) background variables showed that excepting father's educational level, none of the variables was related to academic achievement.

Another biographical variable examined in connection with differential achievement is the study habits. Investigations reveal that the variable can be profitably explored in understanding the differences between the over-achieving and the under-achieving groups, because most of the studies record a positive association between study habits and achievement. Holtzmann, Brown and Farquhar (1954) obtained a significant relation between study habits and college achievements. Brown and Holtzmann (1956) observed study habits to be a good predictor of academic achievement, both at school and college levels. Chahbazi (1958), using a study-habits inventory observed that the majority of the items could discriminate the over-achievers from the under-achievers and that a sizable portion of the achievement variance could be explained by study habits scores. Norton (1959) obtained the measures of study habits by two ratings—one by the teachers and the other by the students themselves. The teachers' ratings proved to be a poor predictor of achievement but the students' rating was a statistically significant predictor. Jamuar (1966) noted a positive relation between the scholastic achievement and the study habits. Srivastava (1968) also obtained different patterns of study habits for the over- and the under-achievers. Compared with the over-achievers, the under-achievers appeared to devote less time to their studies, had faulty habits of concentration, could not properly plan their studies and required more time to develop the 'right mood to study'.

Conclusions

In the light of the results considered in the earlier sections the following observations may be made.

1. Uptill now our understanding of the differentiating characteristics of over- and uner-achieving students is far from complete. None of the areas has so far revealed any set of variables that can be said to have a definite association with achievement discrepancy of any kind.

2. Results from the individual studies are hardly comparable. The similarity in the results noted in some of the studies is apparent rather than real because the variables in these cases have not been measured by the same tests, and there are reasons to believe that some of the traits measured by the different tests may have the same names but 'do not assay the same dimensions' (Ellis, 1953).

3. The majority of the reported studies appear to have made what may be called a test-oriented approach. That is, the investi-

gators have tried to ascertain how far the traits measured by a certain test can discriminate the two groups. In many cases such tests have been arbitrarily chosen and the rationale guiding this choice is missing in the reports.

4. Diversity in results may also be viewed as an outcome of the methodological differences in the identification of discrepant achievers. The estimation of expected achievement is based in some cases on sophisticated statistical methods, and in some others it is just arbitrarily determined. There are still other studies where no expected achievement is worked out but a direct comparison of the ranks of the students on the two variables (aptitude and achievement) is made. Owing to this procedural difference it may so happen that a person designated as an over-achiever or an under-achiever by one method may be characterized as a normal achiever by some other method. In fact, it has been empirically shown that in the majority of cases there is 'little or no agreement among techniques in which an individual finally is designated as a discrepant achiever'. (Farquhar and Payne, 1964).

5. Factors like age, sex, grade, course of studies and the ability levels of the students have not been properly controlled in many studies. But it is essential for comparability of results that the subjects of different studies should be alike with respect to these facors. Moreover, the possibility of the existence of several patterns of differences between the over-achievers and the under-achievers belonging to differnt, sex, grade, course and ability level cannot be totally ruled out. Unless the experimental design takes this fact into account, the patterns are not likely to be discovered.

6. A comprehensive coverage of the variables from all the three non-cognitive domains appears to be absent in the majority of the studies. Consideration of factors belonging to one single area is almost the general feature of studies conducted on discrepant achievers. But for a fuller probe into the problem, a sampling of variables from all the three areas appears to be necessary.

In conclusion, it may be said that the investigations conducted so far do not lead to any confident generalization regarding the non-cognitive syndromes of achievement discrepancy. But there are indications that each of the three non-cognitive areas offers sufficient scope for a meaningful understanding of the non-intellectual characteristics of deviant achievers. With proper control of several factors which appear to have vitiated the previous results a more satisfactory answer to the problem may be found out. What is needed for the purpose is more research.

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A Study of Some Personality Traits of High Creative Children at School Stage

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This study was undertaken to find out some of the personality traits of high creative children at school stage. The sample comprised 300 students from Classes VI, VII and VIII from three schools in Punjab. Three verbal tests of creative thinking abilities and a teacher-rating scale were developed and administered, respectively, to the students and their teachers. A comparison of the high-creative and the low-creative groups with regard to their personality characteristics indicated that high creative children are more energetic, more introvert and more independent in thought and action. They have open minds, they reject repression and suppression as mechanisms for the control of impulses, and can tolerate ambiguity and entertain opposing values.

What is the personality pattern of a high creative individual? What are the distinguishing non-cognitive factors of the highly creative vis-a-vis those of the less creative? Various studies have been made on children and adults to find answers to these questions and investigators like Cattell and Drevdahl (1955), Drevdahl (1956), Drevdahl and Cattell (1958), Barron (1957, 1963) and Cross, Cattell and Butcher (1967), have established some clearly differentiating factors.

In general, the same factors have distinguished creative writers and eminent research scientists, both from the general population and from less creative men and women of equal intellectual ability. The commonest findings in terms of factors measured by the 16-PF test (Cross, Cattell and Butcher, 1967) are that creative adults tend to be schizothyme (A—), dominant (E+), self-sufficient (Q2+), desurgent (F—), bohemian (M+), and radical (Q1+).

There are several other studies available on adults based either on observation or on measures other than the 16-PF. To mention a few, Barron (1955), on the basis of his study on 100 captains in the United States Air Force concludes, "Freedom of expression and movement, lack of fear of dissent and contradiction, a willingness to break with custom, a spirit of play as well as of dedication to work, purpose on a grand scale: these are some of the attributes which a creative social entity, whether vast or tiny, can be expected to have." Hitt and Stock (1965) found from amongst the scientists and engineers employed in a research laboratory that the Type I researcher (high on both originality and logical reasoning) is not cautious but is responsible and energetic. Barron (1958) in his studies of highly creative people found creative individuals "more original, less suggestible and more tolerant of structural disorderliness." MacKinnon (1960) describes a syndrome of creativity, and to him the qualities related to creativity include self-assertion and dominance, a high level of energy, absence of repression and suppression as mechanisms for the control of impulses and images, introversion, and independence in thought and action.

Some efforts have also been made to study the personality qualities of creative children. It has been found that creative children, as compared to the non-creative children, tend to be more social, more warm-hearted, and less anxious (Reid, King and Wickwire, 1959). They have a reputation for having wild and silly ideas; their work is characterized by the production of ideas, "off the beaten track", "outside this world", and by "humour, playfulness, relative lack of rigidity and relaxation" (Torrance, 1962). They have a wide range of interests, and emotional stability and, unlike the high I.Q. group children, are unmindful of the teacher's approval (Getzels and Jackson, 1962).

PROBLEM

The present study is in line with the few studies mentioned above. Its purpose is to find out some of the personality traits of high creative children at the middle-school stage. Earlier research findings in the field suggested to the investigator the formulation of the following rather specific hypotheses:

1. That high creative children will exhibit a high level of energy.
2. That the high creative children will reject repression and suppression as mechanisms for the control of their impulses.
3. That the high creative children will be more introvert than extrovert.
4. That the high creative children will be more independent in both thought and action.
5. That the high creative children will be open to all kinds of experience.
6. That the high creative children will have a capacity to tolerate apparent confusion or ambiguity while solving problems.
7. That the high creative children will have a capacity to entertain opposing values.

PROCEDURE

Subjects

Three hundred boys from Classes VI, VII and VIII studying in three high/higher secondary schools of Patiala district in Punjab formed the sample of this study. The number of *Ss* for each class was kept at one hundred. The age-range of the sample varied from 10 plus to 13 plus.

Two of the schools selected for the purpose of this study were urban, one a model high school and the other a stereotyped traditional higher secondary school. The model school has the reputation of being the type of school where the environment is relatively "open" and "responsive", where the pupil's uniqueness in perception and thinking is accepted and where originality, experimentation, initiative and invention are respected and encouraged. By and large, the pupils in this school come from the upper-middle and higher strata of society. In most cases, both parents are educated.

The other urban school is considered representative of the type where creativity neither finds a favourable nor an unfavourable climate. Most of the students come from the lower-middle and middle classes of society. Generally, one of the parents, the father, has some schooling or college education.

The third school, a rural one, is considered to be of the "closed" type where conformity receives the greater emphasis. Most of the students come from the lower and lower-middle classes of the society. Generally neither parent has had any schooling.

The boys, totalling 55 in Classes VI, VII and VIII, of the model school were included. As for the other schools, since the number of students in these classes was much more than required, the *Ss* were selected randomly by taking alternate roll numbers from the attendance registers of each class. In all, 122 students were taken from one school and 123 from the other.

Instruments

The non-availability of suitable tests of creativity which could be used on Indian children made it necessary for the investigator to undertake the time-consuming and laborious job of constructing a few tests and also a Criterion Form in the form of a Teaching Rating Scale against which these tests could be validated and which could also be used for obtaining personality ratings from teachers for their pupils.

Construction of the Teacher Rating Form. For constructing the Teacher Rating Form, the first thing done by the investigator was to prepare a list of intellectual and personality traits usually found in creative persons. A list of 10 such traits was developed. The first part of the scale was concerned with three well-known aptitude traits found in all creative persons, i.e., the traits of fluency, flexibility, and originality. They were included in the scale so that the scale could serve as a Criterion Analysis Form against which the creativity tests could be validated. The second part of the scale dealt with the following seven personality traits which, it was hypothesized, the creative children possess: (1) high level of energy, (2) absence of repression and suppression, (3) introversion, (4) independence, (5) openness of mind, (6) tolerance of ambiguity, and (7) entertaining opposing values. These traits were represented on the scale so that the scale could be used as an instrument of personality assessment.

All the ten traits of creative persons represented on the scale were described in behavioural terms. A Criterion Analysis Form consisting of 60 statements divided into 10 sets of 6 statements each was prepared. Thus there were 6 statements pertaining to each trait. The Form was sent to 14 judges, teachers of repute, both in training colleges and in schools. Their task was to determine whether the statements included in the Form were characteristic of or not characteristic of creative children. On the basis of responses received by them, four statements pertaining to each trait—forty in all—getting the highest scores were selected for inclusion in the final form of the Teacher Rating Blank.

Construction of the Creativity Tests. Three verbal tests on the lines of Torrance's tests, namely, (1) Unusual Uses Test, (2) Consequences Test, and (3) Common Problems Test, were constructed. The validity data for the tests were obtained through teacher ratings. Three ratings were obtained for each of the 300 *Ss*. The validity coefficients found were .40 for fluency, .32 for flexibility, .34 for originality, and .39 for composite creativity ($P < .01$ in each case). The interscorer reliability coefficients were .98 for fluency, .96 for flexibility, and .87 for originality.

The tests included the following verbal stimuli:

1. List as many unusual uses as you can think of for the folowing articles: (i) a piece of stone, (ii) a wooden stick, (iii) water, and (iv) cotton.
2. What would happen: (i) If man could fly like a bird? (ii) If your school had wheels?
3. List as many problems as you think can arise in the following two situations: (i) entertaining a guest, and (ii) doing homework.

Collection and Analysis of Data

Data from the children on tests and from teachers on the Rating Form were collected simultaneously. Three ratings for each child (900 ratings in all) were obtained by teachers who had known their children at least for the last one year. The teachers were requested to rate each *S* on each of the statements included in the form on a three-point scale: high, average, and low. In quantifying the ratings, the values 3, 2 and 1, respectively, were assigned to these categories. Scoring was done trait-wise. First, a total score for each trait was worked out for each teacher, and then a composite score for all the three teachers. Finally, a mean score was obtained by dividing the composite score by the number of raters, three in this case.

Scoring on creativity tests was done using scoring guides developed by the investigator with the help of experts. Responses were scored for fluency, flexibility and originality. Raw scores for these three variables were converted into standard scores on a distribution with 10 as the standard deviation and 50 as the mean. A composite creativity score was obtained for each *S* by adding his standard scores on all the three traits.

Two extreme groups consisting of high creatives and low creatives, respectively, were formed on the basis of the composite creativity scores. Those getting the highest 20 per cent scores were included in the high-creative group, and those getting the lowest 20 per cent, in the low-creative group. The means of both the extreme groups for each of the seven personality traits were computed and the t-test was applied to determine the significance of difference between the means of the two groups. The results obtained through the t-test were checked by applying the median test of chi-square.

RESULTS AND DISCUSSION

The group comparisons specified in the predictions involved in the hypotheses formulated earlier are presented in Table 1. The means, standard deviations, and t-ratios for the scores of both the groups, the high-creative as well as the low-creative, on each of the seven personality traits taken up in this investigaton are shown in this table.

As the table indicates, all the differences in means favour the high-creative group, and these differences are significant beyond the .01 level.

TABLE 1

Tests of Hypotheses

Hypotheses	*High Creatives* (N=60)		*Low Creatives* (N=60)		*t*	*p*	*x*	*p*
	Mean	S.D.	Mean	S.D.				
1. High level of energy	8.48	1.57	6.77	1.10	6.84	.01	26.16	.01
2. Absence of repression and suppression	8.10	1.54	6.53	1.07	6.49	.01	32.77	.01
3. Introversion	7.78	1.27	6.90	1.14	4.00	.01	15.98	.01
4. Independence	7.93	1.35	6.65	1.12	5.66	.01	21.86	.01
5. Openness of mind	8.13	1.35	6.77	1.07	6.13	.01	24.36	.01
6. Tolerance of ambiguity	8.12	1.45	7.00	1.10	4.77	.01	9.66	.01
7. Entertaining opposing values	8.23	1.44	7.38	1.24	3.47	.01	7.78	.01

Results of the chi-square analysis comparing the two groups are also presented in Table 1. They too indicate that the differences between the high-creative and low-creative groups in all the seven personality characteristics are statistically significant beyond the .01 level.

Statistical evidence yielded by the t-test of significance as well as by the median test of chi-square leads one to conclude that there is, without any shadow of doubt, a significant difference in the personality patterns of high-creative and low-creative children, and that the hypotheses, which the investigator formulated in the beginning of the study, stand all confirmed when put to test. That means that high-creative children at school stage: (1) possess a high level of energy, (2) reject repression and suppression for the control of their impulses, (3) are more introvert, (4) are more independent in both thought and action, (5) have open minds, (6) can tolerate ambiguity, and (7) entertain opposing values. As pointed out by earlier researchers (Mac-

Kinnon, 1960; Torrance, 1962; Getzels and Jackson, 1962) and as confirmed by this study, such children are unconventional, original and unmindful of teacher approval.

The findings of the present study are also significant in that they successfully resolve the long standing controversy on whether teacher ratings could be adequately relied upon as a measure of identifying creative children in schools. The fact that those children who were identified as high creative on the basis of their scores on creativity tests also obtained higher scores on teacher ratings for all the personality traits than their low-creative counterparts, suggests that high reliance can be placed upon teacher ratings as a device of identifying creative potential in our schools. Their validity, of course, depends upon the seriousness with which they have been obtained and given. The longer and the more frequently the responding teachers have had the opportunity to watch their pupils from close quarters and in informal situations, the more the chances of their ratings being valid. This study seems to confirm unambiguously the conclusion of Yamamoto (1965), arrived at on the basis of his research findings: "Nevertheless, in actual studies of creative thinking, ratings by informed teachers who have been given enough time to get acquainted with their children would seem to be able to distinguish the creative pupils from the less creative ones when asked to nominate them on specific criteria such as 'coming up with most ideas' (Fluency), 'finding a new way of meeting problems' (Flexibility), and 'best at thinking of all the details' (Elaboration)."

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Patterns of Academic Development

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The authors discuss a longitudinal study undertaken by them to find out if different patterns of academic development could be discerned, and if so, what the association with these patterns would be of some factors such as verbal and non-verbal intelligence, learning ability, creativity, study methods, self-concept, socio-economic status and teachers' ratings on achievement and intelligence.

Academic development has always been considered to be a very important factor in the life of an individual because of the assumption that a good academic record over years, to a large extent, predicts future success of the person especially in fields allied to academic ones. In fact, in this age of competition, the academic record invariably figures as the main basis of selection for admissions to educational institutions, higher studies, advanced studies for research, scholarships, entrance into jobs and even for promotions thereafter. Stephens (1956) has observed that though emphasis on academic matters to the exclusion of other facets of development would be deplorable, hardly anyone can advocate any real neglect of the development of academic skills, because a fuller life would be impossible for a child without adequate mastery in intellectual and scholastic arts. Academic development, thus, has acquired a unique importance in the educational life of an individual.

Academic achievement is a resultant of many forces working on the child and the research literature is replete with studies on the relationships of academic achievement with different demographic, organismic and environmental variables which have been classified into various categories by different investigators, some of the main ones being intellectual and non-intellectual factors, subjective-objective factors or factors relating to the four main components of learner, learning process, learning material and the teacher. However, very little work has been done to trace the academic development of a child over a number of years. Terman's longitudinal studies of gifted children are too well known and these have thrown light on some of the trends of academic development. Stephens (1956) has reported some growth curves but they relate to some specific tasks such as scores on silent reading or growth on certain test scores. Besides these, only one reference was available where Kowitz and Armstrong (1965) attempted to trace the academic patterns. According to them, the patterns of 'late bloomers', 'underachievers' or 'A-one students' existed only in literature. Taking the longitudinal records of over a thousand high school pupils in New York, they concluded on the basis of their results that: (1) once the students' grades declined, they would rarely return to their previous level, (2) those rated 'good' or 'poor' at the elementary school were rated 'good' or 'poor' respectively on teachers' grades at the high school, and (3) about four per cent of the total group were found to be 'late bloomers'. These investigators did not mention the causes or the associating variables for the different patterns. No other reference in the research literature, to the best of the authors' knowledge was available in this field. The present investigation was, therefore, planned with a purpose of tracing the academic development of students over years and of studying the relationship of certain relevant variables to academic development. The objective, chiefly, was to investigate if different patterns of academic development can be observed and if so, what the association with these patterns would be of some factors such as verbal and non-verbal intelligence, learning ability, creativity, study methods, self-concept, socio-economic status and teachers' ratings on achievement and on intelligence. Since no previous references were available and the study became more of an exploratory nature, no definite hypotheses could be formulated. But the main aim was to find out if different patterns of academic development could be differentiated on these variables.

METHOD AND PROCEDURE

Method

The longitudinal method for tracing the development was preferred to the cross-sectional one because the main aim was to obtain individual patterns of academic development. Cross-sectional data would have been helpful only in obtaining group means at various levels which are useful for group comparison but not for studying individual growth. The present study, therefore, is a longitudinal one but could not be conducted prospectively over a span of ten or eleven years because of the obvious difficulties and improbabilities of collecting data over such a large span of time. On the other hand, the academic records were obtained, retrospectively, for students studying in the final or pre-final class, which would yield the growth curves over a long range of years.

Sample

The longitudinal nature of the study naturally restricted the size of the sample. In order to avoid the complicating influences of different educational environmental variables in operation at various schools, it was decided to choose only those cases who remained in the same school right from the lower K.G. Class upto the high or higher secondary classes (for maximum number of years). Students who either joined or left the school in between were excluded from the sample. Moreover, only those students could be included in the sample for whom the academic records for all the years were available. Thus, after the initial scrutiny of the academic records for all the school years in various schools, the final sample selected was 62 students of Classes X and XI from the public schools of Simla and Chandigarh. Many other schools could not be taken up for study because they did not maintain the records of students' academic achievements for all the school years. The sample was deliberately taken from the final and pre-final classes as that would yield the data for the academic growth for the maximum number of years. The sample thus had to be selective in nature.

Tools and Materials

The study required the data on a large number of variables and, therefore, different methods of data collection had to be used. These were: testing, experimentation, rating scales, questionnaires and the use of cumulative records. The following were the tools, tests and materials used for the study.

a. Academic Achievement Scores. The use of standardized achievement tests was out of question because no standardized achievement tests for all subjects for all levels were available nor was any cumulative record available for scores on such tests at any class levels at any schools. Thus, the authors had to be satisfied with the achievement scores as were available from the year to year class examinations. Moreover, no direct comparison between achievement marks at different class levels was possible. Therefore, the marks were converted to class position for being amenable to direct comparisons. Because of different number of students in each class, percentage of class position was finally accepted for tracing the growth curves.

b. Verbal Intelligence. For this the Army Alpha Modified Form 9 which had been adapted by Deo and Hari Singh (1966) at the Department of Education, Panjab University for use in this part of the country was used. The reliability coefficient of this adapted form by test-retest method was observed to be .92 and the concurrent validity coefficient against Jalota's test was .63.

c. Non-verbal Intelligence. This was measured by Raven's Standard Progressive Matrices, which is a standardized test with test-retest reliability coefficients ranging from .83 to .93 and the concurrent validity coefficient against the Terman Merrill scale being .86.

d. Study Methods. The California Study Methods Test standardized by Carter (1950) was used to measure the study methods of the pupils for which reliability and validity have been established by the author. The reliability coefficients range from .60 to .72 and cross-validation has been reported by the author (Carter, 1953).

e. Creativity. For this, the test battery of Tests of Creativity, standardized by Deo and Passi (1969) at the Department of Education, Panjab University was used. The test-retest coefficient of reliability for the whole score was .92 and the concurrent validity coefficient against the check list was .46. Factorial validity for these tests has also been established.

f. Self-concept. The PWL (Personality Word List) standaridzed for measuring self-concept by Deo (1964) was used; for this the high reliability coefficient of .89 has already been reported by Deo and the discriminant and convergent validity for the same has also been established (Deo and Singh, 1971).

g. Learning Ability. An experiment was conducted on all the pupils by taking a small group of about 10-12 pupils at a time. Ten non-sense syllables were used and the criterion of learning was two perfect consecutive serially correct reproductions of the list. The learning ability score was the total number of trials including the last two trials. Assistants were used to exercise control of interfering variables and the whole procedure was a standardized one.

h. Socio-economic Status Scale. This scale was developed by the authors for obtaining measures of socio-economic status (Deo and Mohan, 1969). This deals with financial and social status of an individual.

i. Educational and Social Habits Scale. This scale which was also developed by the authors (Deo and Mohan, 1969) was administered to measure the students' educational habits and their participation in curricular, co-curricular and extra-curricular activities in the school.

j. Scale of Attitudes toward the School and Teachers. This has items to measure the general attitude of the students towards the school and the teachers. This scale also was developed by the authors (1969).

k. Teachers' Ratings. The teachers were provided with the five-point scales to rate the pupils on two variables separately, i.e., intelligence and achievement. A gap of a few days was given in between the ratings on the two variables to avoid the influence of one on the other or of the halo effect. To minimize the subjectivity in ratings, the rating scores for the same pupils on both the variables were obtained by using more than three, usually five teachers, and an average of the ratings by five teachers was accepted as the score for the individual. The rating scale was given to those teachers who knew and taught the students to be rated for more than three or four years. Since the five-point scale obtains more discrimination and has the advantage of drawing attention to various kinds of deviations, it was accepted by the authors.

DATA COLLECTION

Thus, the data for all the variables mentioned above were collected for all the pupils of the sample, either in groups or individually as the occasion demanded. The scoring was done according to the specific instructions given for the measurement of each variable.

Analysis of Data

Patterns. Since the major purpose of this study was to obtain the growth curves and thereby the academic development patterns, the achievement scores could not be pooled together. A growth curve was plotted for every student on the basis of his per cent positions in class from year to year. Thse growth curves revealed two distinct trends in their patterns; some showed stability and some great instability. Some objective measures, therefore, had to be devised to differentiate a stable pattern from an unstable pattern. After a number of tryouts the final criterion accepted was that the pattern was considered to be stable if the variations in the per cent positions remained within the range of 20. Whenever the difference in per cent positions exceeded 20, the pattern was considered to be unstable. A scrutiny of the various pattrens curves also proved that this criterion was successful in discriminating between stable and unstable patterns. Stable patterns exhibited somewhat constant and regular academic achievement over years and the unstable patterns showed marked changes and shifts in academic achievement.

Stable Patterns. A further study of the stable patterns showed that some pupils were going steady at a high level, some at a low level and some at an average level. Some objective criterion again had to be fixed up to distinguish between these different patterns. The cutting scores were taken as 30 per cent above and 30 per cent below and 40 per cent in the middle. Thus, the cases for whom the per cent positions always remained between 1 to 30 per cent were classified into the category of 'high achievers'. Those falling between 30 to 70 per cent came under the category of 'average achievers'; and between 70 to 100 per cent as 'low achievers'. This classification was based on the well accepted 30 per cent criterion, frequently mentioned in the research literature.

Unstable Patterns. A close scrutiny of these patterns indicated some distinct trends of the growth curves obtained. Some pupils started at a low level but maintained a constant and gradual rise in their academic achievements and thereby in their positions in the class. These were named as 'improving patterns' or the 'late bloomers'. Some growth curves revealed that the students initially started at a high level but gradually went on deteriorating through the school years. These patterns were called 'deteriorating patterns' or the 'morning stars', which fade out later in the day. In both the improving and deteriorating patterns, the changes in positions were very wide. There seemed to be a third sub-pattern in the unstable group where there were wide fluctuations and marked ups and downs randomly placed in their growth curves. These were called the 'fluctuating patterns' or the 'glowworms' which shine periodically. These cases showed that there was no constancy of academic achievement and no stability in these cases but some times their achievement would come in the high group, some times in the low group and otherwise in the average group. Further objective criterion was applied to classify the cases into the above mentioned three sub-patterns of instability. Differences in the consecutive positions of one individual for all the years were calculated and an algebraic sum of all these differences was obtained for each individual. Those cases which showed the total difference score of 10+ were classified into the improving patterns, those with 10– into deteriorating patterns and those coming between –10 and +10 were put into fluctuating patterns. This objective criterion seemed to tally successfully with the trends reflected by the growth curves and, therefore, was finally accepted. It was observed that out of 62 in the sample, nine cases fell in the stable and 53 in the unstable group. Amongst the stable patterns, three were high achievers, four average achievers and two low achievers. From 53 in the unstable group, 17 were improving cases, 21 deteriorating and 15 were fluctuating ones.

Data Processing and Techniques

The scores obtained for all the pupils on all the variables were tabulated first for the whole group, then separately for the stable and the unstable groups and lastly, for all the six sub-patterns separately to yield useful comparisons. The means, standard deviations, skewness and kurtosis for the whole group were worked out. Use was made of t-ratios to find out the significance of differences between means of different groups. Further, analysis of variance was applied to study the significance of differences in means of variables in all the six groups. Since all the variables are normally distributed in the population as can be verified by the research reports, the use of t-ratios and analysis of variance was justified. The number of boys and girls in the sample being uneven (only five girls and 57 boys), no attempt was made to study sex differences either in the patterns or on any other variable.

RESULTS

Table 1 presents the means, standard deviations, skewness and kurtosis for all the variables under study calculated for the whole group. This would provide an idea of the average performance of all the pupils in the sample on the different measures taken. It may, however, be noted that due to certain casualties, while collecting the data, the scores on some variables in the case of certain students were not available, hence the difference in number of cases.

For the purpose of comparing the stable and the unstable groups, the means, standard deviations, standard errors of the differences and

TABLE 1

Variable	*N*	*Mean*	*SD*	*SK*	*KU*
1. Verbal Intelligence	62	124.50	18.80	1.95	.221
2. Non-verbal Intelligence	62	43.61	7.44	−0.84	.208
3. Study Methods	62	90.95	14.12	0.10	.233
4. Creativity	44	144.40	30.34	0.98	.269
5. Learning	44	6.23	1.68	0.03	.308
6. Self-concept-Perceived Self	44	33.36	18.12	−0.57	.175
7. Discrepancy	44	44.27	14.77	0.20	.104
8. Socio-economic Status Scale	44	78.93	29.05	0.15	.238
9. Social and Educational Habits	44	25.07	5.82	−0.03	.230
10. Attitude towards School	44	10.36	2.64	0.17	.262
11. Teachers' Ratings on Achievement	62	13.08	3.35	−0.01	.258
12. Teachers' Ratings on Intelligence	62	14.11	2.79	1.40	.188

M' s, SD' s, SK and KU are on all variables for the whole group.

the t-ratios on all the variables for these two groups were calculated. These are given along with the levels of significance in Table 2.

TABLE 2

Variable	*Group*	*N*	*Mean*	*SD*	*SED*	*t*	*Remarks*
1. Verbal Intelligence	I	9	125·60	22·67			
	II	53	124.03	17·76	7·94	·19	Not significant
2. Non-verbal Intelligence	I	9	49.30	8·20			
	II	53	43.99	8.54	2.97	1.78	Significant at .01
3. Study Methods	I	9	95.38	17.87			
	II	53	90.82	11.65	6·16	.74	Not Significant
4. Creativity	I	4	124.00	34·67			
	II	40	108·12	30·26	17.98	.88	N.S.
5. Learning	I	4	4.00	2.45			
	II	40	6.25	1.74	1.41	1.59	N.S.
6. Self-concept-Perceived Self	I	4	40.70	17·95			
	II	40	36.50	16·46	9·34	·45	N.S.
7. Discrepancy	I	4	36.25	4.79			
	II	40	45.70	15.64	3.44	2.77	Significant at ·01
8. Socio-economic Status Scale	I	4	77·25	35·11			
	II	40	82·12	29.04	18.15	·27	N.S.
9. Social and Educational Habits	I	4	28.5	5.79			
	II	40	24.9	5.47	3.02	1·19	N.S.
10. Attitude towards School	I	4	11.5	2.38			
	II	40	10.0	3.47	1·31	1.14	N.S.
11. Teachers' Ratings on Achievement	I	9	15.83	4.00			
	II	53	11·73	3.01	1·39	2·09	Significant at ·01
12. Teachers' Ratings on Intelligence	I	9	15·83	4.32			
	II	53	13·80	2.47	1·48	1.37	N.S.

Note : Group I — Stable patterns; Group II — Unstable patterns.

M' s, SD' s and t-ratios are on all variables for the two groups.

Since it was observed that the stable and the unstable groups were more heterogeneous than homogeneous, further detailed comparisons were done on all these variables for all the six sub-patterns of high, average and low achievers and of improving, deteriorating and fluctuating achievers. These results are given in Table 3.

TABLE 3

Variable	Stable Patterns			Unstable Patterns		
	High Achievement	*Average Achievement*	*Low Achievement*	*Improving*	*Fluctuating*	*Deteriorating*
1. Verbal Intelligence	137.67	128.25	106.50	120.53	127.5	123.1
2. Non-verbal Intelligence	46.67	50.25	49.0	42.3	44.0	44.7
3. Study Methods	98.67	100.00	72.50	89.60	92.3	92.3
4. Creativity	133.00	115.00	—	94.45	113.6	116.37
5. Learning	5.50	6.50	—	6.5	6.2	6.1
6. Self-concept-Perceived Self	27.0	54.50	—	29.9	42.91	36.4
7. Discrepancy	40.0	32.50	—	47.38	39.7	48.1
8. Socio-economic Status Scale	97.50	57.0	—	74.3	75.86	91.37
9. Educational and Social Habits	48.0	57.0	—	26.62	22.18	22.44
10. Attitude towards School	9.0	13.50	—	10.2	10.68	10.38
11. Teachers' Ratings on Achievement	20.33	13.50	13.50	13.75	12.7	9.5
12. Teachers' Ratings on Intelligence	20.67	13.00	14.00	14.85	13.76	12.9

Total No. of cases : 62 ; Stable patterns—9 ; Unstable patterns—53.

Mean Scores are on all variables for the six sub-patterns.

In order to find out if the differences between the six sub-groups are statistically significant or not, analysis of variance was applied. A summary of the F-ratios along with the levels of significance is reflected in Table 4.

TABLE 4

Variable	*F*	*Remarks*
1. Verbal Intelligence	1.22	Not significant
2. Non-verbal Intelligence	13.66	Significant at .01
3. Study Methods	1.41	N.S.
4. Creativity	4.72	Significant at .01
5. Learning	.16	N.S.
6. Self-concept-Perceived Self	6.64	Significant at .01
7. Discrepancy	.50	N.S.
8. Socio-economic Status Scale	1.38	N.S.
9. Educational and Social Habits	1.16	N.S.
10. Attitude towards School	1.20	N.S.
11. Teachers' Ratings on Achievement	4.4	Significant at .01
12. Teachers' Ratings on Intelligence	6.5	Significant at .01

F-ratios are for all variables for the six sub-patterns.

DISCUSSION AND CONCLUSIONS

Since the major purpose of the investigation was to find out if different patterns of academic development can be located, the authors have been successful in detecting the different patterns. It appears that the academic development runs in two directions, viz., stable and unstable. A further scrutiny of each of these patterns revealed that each pattern yielded sub-patterns: within the stable group were observed three different sub-patterns of high, average and low achievers. It may be noted here that most of the studies on high or low achievers have collected data based on achievement at one particular stage only. Our study has given the high, average or low achievers as are observed over a long span of school years. The sub-patterns within the unstable group indicated three different types of improving, deteriorating and fluctuating students in their achievement. Typical cases, one from each of the six sub-patterns, amply showed the trend of academic development for the different sub-patterns. Each pattern cuvre was self-evident and was distinct from the others. The stable patterns showed steady and constant growth curves over years. The teachers ordinarily are familiar with such terms as bright, average or poor students, but no one so far has bothered to trace the growth curves or to locate the patterns of academic development in school years. The patterns of growth curves, therefore, should interest not only the researchers but also the teachers who should try to understand not only the differences in academic growth curves but the factors which are associated with such differences.

Table 1 shows the whole group in terms of the various variables under study. Almost all the variables have shown near normal distributions, which can be expected of a sample in this study. These statistics for the stable and the unstable patterns separately are given in Table 2 which is helpful in the comparison of these two groups. The stable and the unstable groups do not differ significantly on verbal intelligence, study methods, creativity, learning ability, perceived self, socio-economic status, social and educational habits, attitudes towards teachers and school, and on ratings on intelligence by teachers, though there is a marked tendency of the stable group to score higher on all these variables except on socio-economic status scale. The stable group is superior to the unstable group on non-verbal intelligence, self-ideal discrepancy and teachers' ratings on achievement, all the differences being statistically significant at .01 level. The outstanding finding of this study seems to be the significant differences between these two groups on self-ideal discrepancy. The instability in achievement may be due to the large self-ideal discrepancies which may be creating some emotional stress on individuals.

Since these two groups are heterogeneous, consisting of sub-patterns where each pattern is different from the other, it was necessary to compare all the six sub-patterns. The results in Table 3 indicate that the high achievers surpass all the other patterns on verbal intelligence, creativity, learning ability, perceived self, socio-economic status, ratings on achievement and on intelligence by teachers. The low achievers' group compares favourably with the high achievers on non-verbal intelligence but is lowest on verbal intelligence, the average group being the best. This suggests that it is mostly the verbal intelligence which comes into operation in academic achievement and non-verbal intelligence is not reflected by academic records. The low achievers are lowest in study methods, which to some extent explains their low achievement. The deteriorating achievers score even better in verbal intelligence than the improving achievers, suggesting the existence of some non-intellectual factors contributing to their deterioration in achievement. In study methods, the average and the high achievers are superior to all the three unstable patterns, indicating the importance of study methods in the academic achievement. The moderate positive correlations between achievement and study methods have already been reported by Carter (1953). These results suggest the possibility of improving the achievement of pupils by providing them guidance with respect to their study habits.

On creativity, high achievers score the maximum, while the improving achievers obtain the lowest mean score. Low correlations have been observed between creativity and academic achievement. In learning ability, the high achievers' group excels all other groups, thereby pointing to the positive relationship between learning ability and achievement. The difference on this variable between the high achievers and the deteriorating achievers is quite small. Thus, it seems that the deterioration in achievement is not due to the lack of learning ability but some other factors must be coming into play. On perceived self, the high and improving achievers score high, suggesting that they may have better insight into the perception of self which reflects in their better achievement. The higher self-ideal discrepancy score is obtained by the deteriorating achievers, the high, low and fluctuating achievers get almost similar mean scores; this means that achievement is directly affected by the gap between the ideal and perceived selves which may be taken as one of the indications of maladjustment of the individual. This is supported by the t-ratio being significant at .01 level in Table 2.

On socio-economic status, the high achievers come at the top and next come the deteriorating achievers, the average achievers coming low. The deterioration is not on account of low socio-economic status, but due to some personal factors like the self-ideal discrepancy. Some motivational factors also may be responsible for this. For educational and social habits, the average achievers have exhibited maximum participation in cocurricular activities, the high achievers showing moderate participation. All the three unstable patterns indicated average interest in these activities.

On ratings by teachers both on intelligence and achievement the high achievers come very high, thereby proving that teachers are largely influenced in their ratings by the academic achievement of their pupils, practically by equating intelligence to achievement. On ratings, the deteriorating achievers got the lowest scores, showing the awareness of their deterioration by the teachers. The fluctuating achievers did not come up to the level of even low or average achievers, thus coming low in the esteem of their teachers which is not strictly warranted by their intellectual levels and sporadically rising achievements.

The deteriorating pattern supports the finding by Kowitz and Armstrong (1965) that once the students' grades declined, they rarely returned to their previous positions. The improving pattern is similar to the 'late bloomers' observed by Kowitz and Armstrong in their study (1965). The present study has gone beyond the findings of these two authors by giving more patterns of academic developments and by giving a more detailed description of them in terms of relevant variables.

The F-ratios presented in Table 4 strengthen the above findings. Taking the six sub-patterns together, the F-ratio for verbal intelligence was not significant while the one for non-verbal intelligence was significant at .01 level. In study methods, learning ability, socio-economic factors, the F-ratios were not significant. But significant differences at .01 level have been proved by the F-ratios for creativity, perceived self, self-ideal discrepancy and ratings on intelligence and achievement.

Thus, in conclusion, it may be remarked that the present study not only has identified the different patterns of academic development but has also revealed the contribution on some important factors like verbal intelligence, perceived self, self-ideal discrepancy and creativity in the determinaiton of a particular growth curve in academic achievement. The authors, by no means, want to suggest that these are the only contributing conditions. On the other hand, we feel that the study has paved the way to study many more factors like motivation, need achievement, anxiety, attitudes of parents towards children, etc., which can be responsible for shaping the academic achievement pattern of a child.

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Cost Analysis of Education in India—Private and Social Participation[1]

H. N. Pandit

The author has attempted to estimate the cost of the resources used up in the educational process during the three Five Year Plans in India. In this study, the social costs and private costs of education have been estimated separately. The study highlights the importance of neglected inputs, particularly the time spent by the student in education. The growth in costs has been juxtaposed with the growth in the total supply of resources in the Indian economy.

A clear distinction may be made between the concept of costs as used in the economic sense and the term 'expenditure' as used in accounting procedures. An attempt is made in this paper to estimate the opportunity cost of education at current and 1960-61 prices during the first three Five Year Plans in India.[2] The cost of resources used up in the educational process during the period of 16 years has been analysed both from social and private points of view.

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[1] The author records his gratitude to A.L. Nagar for his valuable comments on the draft of this paper, and to J.P. Naik, M.G. Bowman, V.N. Kothari, S.N. Saraf, M. Mukerjee and others for various items of literature and data, and for the valuable discussions he had with them.

[2] The choice of 1960-61 prices as weights for working out costs of input factors at constant prices is in conformity with the practice followed by the National Income Division of the Central Statistical Organisation (CSO), Government of India, for compilation of social accounts for India.

It may be mentioned right here that educational statistics as published by the Union Ministry of Education and other agencies do not help in working out a detailed weighting diagram of educational inputs in the total scheme of social and private costs of education.[3] The major items of social costs are given below:

1. *Institutional costs*
   (a) Current costs
   (b) Capital costs
2. *Private costs*
   (a) Non-tuition costs
   (b) Income forgone.

For private costs of education, the main components are:

1. Non-tuition costs
2. Income forgone
3. Tuition costs minus scholarships received.

A detailed taxonomy of the costs of education is given in diagramatic form (Fig. 1) on the next page. It may be mentioned that the opportunity cost of the time put in by students (income forgone) is a clear case of 'resource-loss' in education, both from the social and the private points of view. And this component of costs enters both social and private costs of education. The transfer payments, such as scholarships and financial assistance by the educational institutions or private donors, do not form an item of social cost of education. On the other hand, these transfer payments not only form part of compensation for the income forgone by the students but also constitute a significant source of private finance for education. Further, expenditure on fee payment is a real burden on parents and it is shown as an item of cost after making necessary adjustments for the scholarships received from educational institutions.

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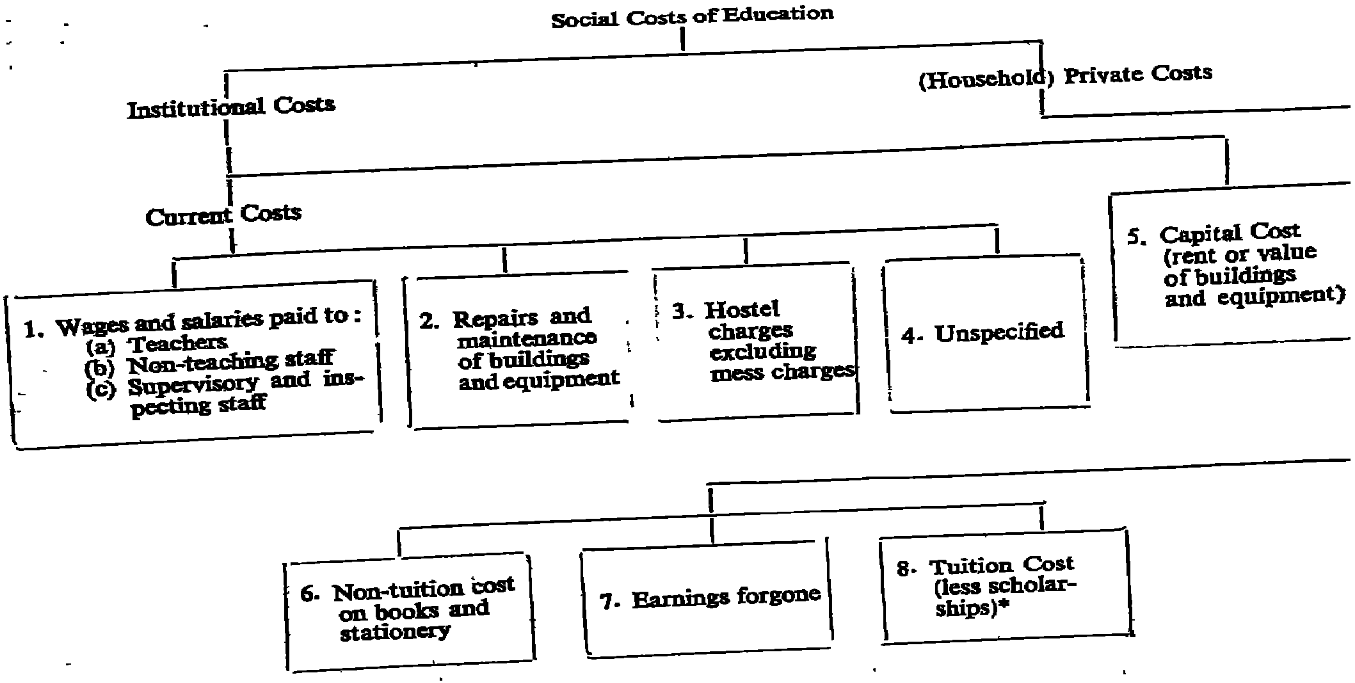
[3] In fact, the Education Commission (1970, para 10.03, p. 859) has strongly recommended the preparation of estimates of costs of education at constant prices but to date no attempt seems to have been made to work out the cost of education at constant prices. This may be due partly to lack of proper methodology and partly to absence of detailed data on the cost of education.


Social Costs of Education
Institutional Costs
(Household) Private Costs
Current Costs
1. Wages and salaries paid to :
(a) Teachers
(b) Non-teaching staff
(c) Supervisory and inspecting staff
2. Repairs and maintenance of buildings and equipment
3. Hostel charges excluding mess charges
4. Unspecified
5. Capital Cost (rent or value of buildings and equipment)
6. Non-tuition cost on books and stationery
7. Earnings forgone
8. Tuition Cost (less scholarships)*

*Not included in the social costs

Fig. 1. Taxonomy of the Costs of Education

THE ANATOMY OF INSTITUTIONAL COSTS

First, it may be mentioned that the data on costs and expenditure on education as published by the Ministry of Education and Social Welfare is limited in scope for the purpose of presenting a detailed picture of the monetary costs of resources used up in the educational process.[4] Keeping in view the nature and scope of the currently available data, the institutional costs, i.e., expenditure incurred by an institution during a given year, are classified into two major categories. These are:

(a) Current costs
(b) Capital costs

Current Costs

Current costs can be further classified into four sub-categories. These are:

1. Wages and salaries paid to
    - —non-teaching staff.
    - —teachers
    - —supervisory and inspecting staff
2. Expenditure on maintenance, repairs, and consumable material of recurring nature, including equipment.
3. Hostel charges, excluding mess charges (maintenance costs).
4. Unspecified.

It is observed from the tabular statement given on p. 121 that the bulk (79.8 per cent) of the current costs are incurred on wages and salaries of personnel engaged in the education industry. It is also seen that 68.7 per cent of the total current cost is incurred as salaries of teachers. Therefore, it is proposed to briefly discuss the principles involved in the wage determination of teachers and to find out how far current payments to teachers represent the opportunity cost of their services in education.

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[4] The Union Ministry of Education and Social Welfare annually brings out *Education in States* and *Education in India* and *Education in Universities*. In these, the Ministry gives expenditure incurred on educational institutions of different types and on direction and inspection, buildings and equipment, scholarships and miscellaneous items. After 1963-64, the non-recurring expenditure on buildings and equipment is presented separately. Fomerly, direct expenditure had only two catgeories, viz., salaries of teachers, and other expenditure. After 1963-64, direct expenditure has four categories, viz., salaries of teachers, salaries of non-teaching staff, equipment and other appliances (recurring), and other items. For further details, see Ministry of Education, *Manual on Educational Statistics, 1964*.

Component of Current Institutional Costs, 1964-65

S.No.	*Item*	*Percentage*
a)	Direct expenditure	
	1. Salaries of teachers	68.73
	2. Salaries of non-teaching staff	8.22
	3. Equipment and other appliances (recurring)	4.34
	4. Other items	12.03
	5. Sub-total (1 to 4)	93.32
b)	Indirect Expenditure	
	6. Salaries of inspecting & supervisory staff	2.89
	7. Hostel charges excluding mess charges	0.99
	8. Unspecified	2.80
	9. Sub-total (6 to 8)	6.68
	Total (5+9)	100.00

Source : *Education in India, Vol.II (1964-65)*

1. *Teacher Costs.* Before going into the internal and external forces which influence teachers' salaries, some important points about the position of teachers and their salaries in the overall economy and within the educational sector are briefly mentioned below.

In 1961, out of a total stock of 5.2 million educated and trained (matric and above) workers employed in the economy, the education industry employed 0.84 million as teachers. In other words, the feedback in educational industry was of the order of 16.3 per cent of the total working force with matric or above qualifications. It is also seen that educated and trained teachers as defined here constituted 31.4 per cent of the total number of educated persons employed in all services put together.[*] This shows the importance of the education industry in the employment of educated workers.

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[*] The stock of educated persons and its break-up in terms of major categories can be seen from *Census of India*, 1961, Vol. I, Part II: 'Social and Cultural Tables'. The qualifications of school teachers have been noted from *Education in India*, Vol. II, 1961, Table 7 (A & B). Sixty-two thousand teachers in higher educational institutions have been assumed to have matric-or-above qualifications. The term 'all services' as used here denotes sectors like public services, educational services, medical and health services, legal, business services, etc., (defined as 'other services' in the 1961 Census).

Consequently, the question of teachers' salaries should find an important place in any discussion on interdependence between education and the economy.[4]

It is seen from Table 1 that the employment of teachers has been increasing at the (trend) annual growth rate of 6.6 per cent and the total expenditure on teacher salaries has increased at the (trend) annual growth rate of 11.95 per cent during the three Five Year Plans. The growth of total expenditure has been of the order of 12.2 per cent per annum. Thus, it is clear that growth in total educational expenditure and growth in teachers' salaries have gone hand in hand during the three Five Year Plans.

TABLE 1

Growth in Teacher Employment, Wages and Salaries, Direct and Total Educational Expenditure and Enrolment, 1950-51 to 1965-66

S.No.	*Item*	*Unit*	*1950-51*	*1965-66*	*(Trend) Annual Growth Rate*
	1	2	3	4	5
1.	Teacher employment	million	0.80	2.13	6.55
2.	Wages and salaries of teachers	crores	61.82	361.40	11.95
3.	Total direct expenditure on education	,,	91.05	493.78	11.83
4.	Total expenditure on education	,,	114.38	622.13	12.17
5.	Total enrolment	million	25.54	770.56	8.40
6.	Average salary per teacher	Rs.	769.39	1694.00	5.06
7.	Pupil-teacher ratio		31.78	33.07	—
8.	Teacher salaries (2)		67.89	73.19	—
	in relation to				
	a. total direct exp. (3)		67.89	73.19	—
	b. total exp. (4)		54.04	58.09	—

Source: *Education in India*, Vol. II, 1950-51 to 1965-66

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[4] Gunar Myrdal in *Asian Drama*, (Vol III, 1968, Chapters 31 and 33) has pointed out the lack of teachers and proper training facilities for them as one of the major handicaps in the development of attitudes favourable to the socio-economic growth of developing countries.

Further, in relation to the 'Direct Expenditure', teacher salaries constituted about 67.9 per cent in 1950-51 and 73.2 per cent in 1965-66, and with respect to total expenditure the share of teachers' salaries was of the order of 54 per cent and 58.1 per cent for the two years respectively. It is thus clear that teachers' salaries form the major portion of the total expenditure, and overall growth in salaries of teachers is responsible for pushing up the cost of education.

The logic underlying the belief that the teaching profession has certain 'intangible' benefits like status and opportunities for self-expression and that persons joining as teachers are not guided mainly by the relative and absolute levels of wages has lost its force in present-day society. Most of the intangible benefits associated with a profession depend to a large extent on the tangible benefits. Therefore, it is clear that earnings in the teaching profession should be analysed on the same lines as is done in any sector of the general labour market.[1]

Education has to depend on external sources (i.e., grants and direct assistance given by the Central and State governments and their agencies). Fee income, which forms the single source of internal finance, constituted, for example in 1965-66, one-sixth of the total educational expenditure. Thus, the capacity to pay for the services of teachers at an institutional level depends on the assistance received from outside sources. Obviously, the wages of teachers at micro-level are governed by their supply price.

If the labour market is considered competitive, one may hypothesise that wages in the education industry are broadly guided by minimum wages (i.e., cost of fulfiling the basic needs), private monetary and opportunity cost involved in the preparation of teachers and earnings of persons with comparable education and training employed in other sectors within the overall constraint of the paying capacity (measured in terms of capacity to mobilise resources) of the government.

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[1] *Report of the Indian University Commission* (1948-49, pp. 70-71). On teacher salaries and crisis in Indian education, also see, Sen (1970), Mathur (1968), and Ovens (1968). We do recognise the fact that earnings are influenced by the social standing of different groups of workers. For a detailed discussion on this point, see, Vaizey (1963, p. 22).

This indeed is a limited economic framework for the analysis of internal and external forces for wages of teachers. In fact, wages are influenced by the social standing of the different groups of workers. (Vaizey, 1963, 22). Sometimes, regional and linguistic barriers, particularly with respect to school-stage teachers, stand in the way of their mobility from one State to another. Besides, there are numerous other factors which govern the determination of wage policies both in education and in other sectors of an economy. In this connection the observations of the Indian Commission on Labour are very relevant and are given below.

> A policy dealing with this crucial problem (wages) cannot be simply economic as it is to reckon with the realities of multi-dimensional social phenomenon, in which besides workers and management, the consumer and the society at large and, in consequence, the State are vitally interested.[8]

This observation is highly relevant to the education industry if the term 'worker' is substituted by the term 'teacher.'

Internal and External Wage Structures. Teachers' salaries have got an internal and an external structure. For example, the recent agitation among Delhi elementary teachers is the result of their frustration arising from their position in the internal wage structure.[9] The flight of higher secondary and university teachers from education to industry, trade and Government services is due to the unfavourable wages paid to the teachers as compared to the external wage structure.[10]

It is, therefore, worthwhile to examine: (a) the inter-educational level comparison of wages of teachers, and (b) the earnings of teachers as a group in relation to the earnings of workers employed in agriculture, manufacturing, trade, other services, and in all sectors put together.

In Table 2 the trend annual growth rates for average earnings

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[8] *Report of the Indian Commission of Labour*, (1969, 220).

[9] Ministry of Education, Circular No. F. 48-27/71-UT1, dated 26.11.1971, regarding revision of pay scales of teachers in elementary schools in Delhi.

[10] To date no scientific study on the brain drain from the education industry to other sectors of the economy has ben made but one finds bright primary and middle school teachers taking jobs as village level workers, clerks, postmasters, revenue assistants, etc., and university teachers joining the IAS and IFS, bank management, research organisations and government departments.

TABLE 2

(Trend) Growth Rates of Average Salary per Teacher, 1950-51 to 1964-65

S. No.	*Institution*	*Average Salary*		*(Trend) Annual*
		1950-51	*1964-65*	*Growth Rate***
	1	2	3	4
1.	Primary schools	545.10	1095.96	4.86
2.	Middle schools	682.38	1302.14	4.58
3.	High/Higher secondary schools	1258.29	1998.39	3.09
4.	Vocational schools	1704.95	2012.97	2.86
5.	Colleges for general education	2696.09	3945.88	2.50
6.	Colleges for professional education	3947.88	3583.57	0.50
7.	University departments	3758.44	12278.14 (6166.76)*	4.28
8.	All Institutions	769.39	1543.14	5 06

**Trend Growth Rates have been computed for 1950-51 to 1964-65.

*1963-64

Source : Annual data on teacher salaries taken from *Education in India*, Vol. II (1950-51 to 1964-65).

TABLE 3

Institutional Disparities in Teacher Earnings and Teacher Cost in Relation to Direct Expenditure, 1950-51 and 1963-64

S. No.	*Institution*	*Average Earnings in Relation to Primary School Teachers*		*Teacher Salaries in Relation to Total Direct Exp.*	
		1950-51	*1963-64*	*1950-51*	*1963-64*
	1	2	3	4	5
1.	Primary schools	100.0	100.0	80.23	88.87
2.	Middle schools	125.2	118.0	75.78	86.90
3.	High/Higher secondary schools	230.8	191.6	69.07	72.95
4.	Colleges for general education	494.6	392.2	57.56	62.80
5.	Colleges for professional education	724.2	483.7	46.93	51.15
6.	University departments	689.4	616.5	23.64	21.36
7.	All Institutions	11.1	141.4	67.90	72.02

Source : As in Table 2

of teachers employed in different types of institutions are given. As we move from lower to higher levels of education it is observed that growth rates are in descending order. The only exception to this is in the case of teachers employed in university departments. As a result of differential rates of growth, inter-level relationships between the wage rates of teachers employed in different institutions have undergone changes and these can be seen in Table 3.

The annual wages of teachers employed in different types of institutions have been expressed in terms of average salary paid to teachers in primary schools in 1950-51 and 1963-64. It may be noted that after 1963-64, on account of re-classification of educational institutions, a comparison of wage data by types of institutions with the base year figures is not possible. It is noted that the gap between the wages of the higher and lower levels of institutions have narrowed down. Despite faster up-grading of wages of teachers in lower levels of institutions, the average wages of primary, secondary, and university teachers were in the ratio of 1:1.9:6.2 as against the desired norm of 1:2:3 suggested by the Education Commission.[11]

From fast increases in wages, the cost of teachers' salaries in relation to direct expenditure has gone up during the 14-year period under consideration. From cols. 4 and 5, it is seen that teachers' salaries in relation to direct expenditure increased in primary schools from 80.2 per cent to 88.9 per cent; in middle schools from 75.8 per cent to 86.9 per cent; and in high and higher secondary schools from 69.1 per cent to 72.9 per cent during the period. This again shows how any increase or decrease in the average salary of teachers has a powerful influence on the current institutional costs of education.

Inter-Sectoral Comparisons. Data on the earnings of the working force according to education, training and experience and sectors of employment are not available for India. The over- or under-payment of wages of one group of workers in relation to workers with similar qualifications and experience employed in other sectors cannot be judged. Still, an attempt has been made to analyse the average wages of teachers as a group, as compared with the wages of workers employed in agriculture, manufacturing, trade, services and all sectors put together.

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[11] *Report of the Education Commission,* 1964-66 (Reprinted in 1970, p. 90). However the Commission has not advanced any basis for suggesting this norm for differential wage payments.

In Table 4 *wage relatives* of teachers in relation to wages of those employed in other sectors have been given. It is seen that during 1950-51 to 1965-66, the ratio of earnings of teachers in relation to agricultural workers have gone up from 1.63 to 2.43 and from 0.77 to .86 in relation to workers employed in the manufacturing industries and from 0.50 to 0.68 in trade and from 0.71 to 0.97 in relation to those engaged in services. In relation to all sectors, earnings of teachers were 16 per cent higher in 1950-51 and 58 per cent higher in 1965-66. From the index numbers given in the table, it is clear that teachers have gained over time, both in terms of monetary wages and of wages at constant prices. It is clear from Rows, 6, 7, and 8 that during the 16-year period, teacher wages have become more than double as against only 68 per cent increase in the consumer price index number and 29 per cent increase in implicit price index for the average earnings of workers employed in the entire economy.

TABLE 4

Average Teacher Earnings in Relation to Average Earnings in Major Economic Sectors, 1950-51, 1955-56, 1960-61 and 1965-66

S.No.	*Ratio*	*1950-51*	*1955-56*	*1960-61*	*1965-66*
	1	2	3	4	5
1.	Teacher/Agriculture	1.63	2.27	2.16	2.43
2.	,, /Manufacturing	0.77	0.79	0.82	0.86
3.	,, /Trade	0.50	0.57	0.65	0.68
4.	,, /Services	0.71	0.83	0.95	0.97
5.	,, /All sectors	1.16	1.42	1.47	1.58
6.	*All Teachers*				
	(*i*) Average earnings (Rs.)	769	919	1217	1694
	(*ii*) Index number of 6 (i)	100	119	158	220
7.	Consumer price index number	100	96	124	168
8.	*Implicit price index number for average earnings in*				
	(*i*) Services	100	96	98	106
	(*ii*) Entire economy	100	88	103	129

Source: Average earnings per worker in agriculture, manufacturing, trade, services and all sectors are taken from Mukherjee and Chatterjee (1968, p. 30). Implicit price indicators and consumer price index number have been shifted to base 1950-51 from original indicators given in Mukherjee and Chatterjee (1968, p. 13).

From the analysis in the preceding paragraphs, it is reasonable to assume that wages paid to teachers represent opportunity cost of their time and effort put in the educational process. Similarly, payments made for other factors in the current costs of education have been assumed to be equal to their opportunity costs.

In Table 5 current costs of education at current prices have been given in cols. 2 to 6, while col. 7 gives the aggregate picture of current costs of education. In the absence of any reliable price indicator, the consumer price index number series has been chosen as a deflator for removing the effect of prices from the current costs of education and the increase in the current costs at 1960-61 prices can be seen in col. 9 of the table. It is observed that current costs (at current prices) have increased from Rs. 101 crores in 1950-51 to Rs. 539 crores in 1965-66 and at constant prices they have increased from Rs. 124.7 crores to Rs. 392 crores during the same period. In Table 6 structural changes in the current costs of education have been given according to the three Five Year Plans. It is seen that the share of the wages and salaries of teachers increased from 64.5 per cent in the First Plan and 66.9 per cent in the Third Plan. While the share of wages of non-teaching staff has marginally declined from 26.1 per cent to 25.4 per cent during the same period. The relative position of supervision and inspection cost has remained constant at around 2.7 per cent during the First and the Third Five Year Plans but showed a decline during the Second Five Year Plan to 2.5 per cent. The trend annual growth rates reveal that the individual input factors have increased at rates varying from 10 to 12 per cent.

Capital Costs

The allocation of an item of expenditure between current and capital costs is usually done on an arbitrary basis. For example, a book purchased for the library is classified as an item of capital cost. If it is purchased for use in the class by the student or a teacher it is classified as an item of current cost. The main components of capital cost in the educational sector are in the form of investment in educational and hostel buildings, furniture and equipment. At present, no estimate of the stock of physical capital in the education industry

TABLE 5

Growth in Wages and Salaries and Related Current Costs of Education

(At current and 1960-61 prices and in crores of Rs.)

S. No.	Year	*Wages and salaries paid to*		*Wages paid to non-teaching staff and other related current costs*	*Hostel charges*	*Unspecified*	*Total current cost at current prices*	*Consumer price index number*	*Current costs at 1960-61 prices*
		teaching staff	*supervisory staff*						
	1	2	3	4	5	6	7	8	9
1.	1950-51	61.82	2.74	29.23	1.82	5.39	101.00	81.0	124.69
2.	1951-52	71.72	3.08	23.95	2.16	4.15	105.06	84.0	125.07
3.	1952-53	78.87	3.14	32.01	1.98	5.34	121.34	83.0	146.19
4.	1953-54	83.86	3.83	35.45	2.12	5.83	131.09	85.0	154.22
5.	1954-55	91.59	3.54	39.12	2.37	7.80	144.42	80.0	180.52
6.	1955-56	101.91	4.00	42.90	2.66	10.34	161.81	77.0	210.14
7.	1956-57	112.60	4.12	47.04	2.89	7.60	174.25	86.0	202.61
8.	1957-58	129.45	4.77	53.04	3.78	11.26	202.30	90.0	224.77
9.	1958-59	144.04	5.68	59.22	4.08	4.62	217.64	95.0	229.09
10.	1959-60	162.49	6.44	65.14	4.36	12.69	251.12	99.0	253.65
11.	1960-61	183.63	7.01	73.73	4.31	12.86	281.54	100.0	281.54
12.	1961-62	208.15	7.87	85.17	5.52	16.52	323.23	102.0	316.89
13.	1962-63	238.90	8.68	93.23	5.55	17.46	363.81	106.0	343.22
14.	1963-64	266.52	10.66	103.56	5.25	17.42	403.41	110.0	366.73
15.	1964-65	310.59	13.06	111.19	4.47	12.65	451.96	126.0	358.69
16.	1965-66	361.40	14.86	132.38	4.89	15.74	529.27	135.0	392.05

Sources : Cols. 2 to 7 : *Education in India*, Vol. II, 1950-51 to 1964-65. For 1965-66, data has been compiled from the Ministry of Education records.

Col. 8 : Mukherjee and Chatterjee (1968, p. 13)

Col. 9 : Col. 7/Col. 8.

TABLE 6

Growth and Structural Changes in Institutional (Current) Costs of Education during Three Five Year Plans

(At current prices, in crores of Rs.)

S.No.	Year/Plan	Wages and Salaries		Wages of non-teaching staff and other costs	Hostel charges	Unspecified	Total
		teaching staff	supervisory staff				
	1	2	3	4	5	6	7
1.	*1950-51*						
	(*a*) Amount	61.82	2.74	29.23	1.82	5.39	101.00
	(*b*) per cent	61.30	2.70	28.90	1.80	5.30	100.00
2.	*First Plan*						
	(*a*) Amount	427.95	17.59	173.43	11.29	33.46	663.72
	(*b*) per cent	64.50	2.70	26.10	1.70	5.00	100.00
	(*c*) Annual growth rate	10.49	7.98	8.00	7.99	13.97	9.62
3.	*Second Plan*						
	(*a*) Amount	732.21	28.02	298.17	19.42	49.03	1126.85
	(*b*) per cent	65.00	2.50	26.50	1.70	4.30	100.00
	(*c*) Annual growth rate	12.47	11.90	11.50	10.12	4.56	11.50
4.	*Third Plan*						
	(*a*) Amount	1385.56	55.13	525.53	25.68	79.79	2071.69
	(*b*) per cent	66.90	2.70	25.40	1.20	3.80	100.00
	(*c*) Annual growth rate	14.50	16.20	12.36	2.54	4.12	13.50
5.	*1965-66*						
	(*a*) Amount	361.40	14.86	132.38	4.89	15.74	529.27
	(*b*) per cent	68.30	2.80	25.00	0.90	3.00	100.00
	Trend Annual Growth Rate (1950-51 to 1965-66)	11.95	10.82	11.83	9.88	11.59	11.44

Source : *Education in India*, Vol. II (1950-51 to 1965-66) is available. In order to find out the economic value of services rendered by buildings, furniture and equipment, the following steps are evolved:

1. Estimation of annual series of stock physical capital in education.
2. Annual depreciation.
3. Annual interest rate.

Each of these is discussed below:

1. *Growth in Stock.* The published figures by the Ministry of Education in *Education in India,* Vol. II, give the non-recurring annual expenditure on education and hostel buildings, furniture, equipment, appliances, etc. No information is given about school buildings erected through public support. Further, up to 1963-64, the break-up of non-recurring expenditure on buildings and equipment is grouped together, and it is only for the year 1964-65 onwards that break-up of capital expenditure in terms of buildings and equipment is available. For example, in 1964-65, the non-recurring expenditure on equipment constituted 27.14 per cent of the total capital expenditure. For the university sector, non-recurring expenditure on buildings and equipment is published in *Education in Universities in India.* From Table 7 (col. 4) it is observed that the university sector has been taking an increasing share from the total capital formation in education. It has gone up from 26.6 per cent in 1952-53 to 50.2 per cent in 1965-66. For the period 1951-52 to 1965-66, the total gross capital formation in the university sector was of the order of Rs. 175.4 crores as against Rs. 294.3 crores in school education; the two were in the ratio of 1:1.7.

In order to estimate capital formation in education at constant prices a 'weighted index of prices for general *pucca* construction' was developed by using the weighting diagram used for input prices series by the C.S.O. for estimation of physical capital formation in India.[11] The index number series is given in Col. 5 of the Table. The capital formation in the education sector at the constant prices of 1960-61 is given in col. 6 of Table 7.

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[11] The weights for price indicators of different inputs as given in CSO (1969, p. 24) are as follows: (i) cement, 15; (ii) iron and steel, 20; (iii) bricks and tiles, 10; (iv) logs and timber, 14; (v) glass, 2; (vi) lime, 2; (vii) electrical goods, 3; and (viii) labour, 33.

TABLE 7

Estimation of Physical Capital Stock in Education at Current and 1960-61 Prices, 1950-51 to 1965-66

S. No.	Year	*Investment in Building and Equipment*			*Buildings construction weighted price index, 1960-61=100*	*Capital formation in edu. at 1960-61 prices*	*Enrolment (In millions)*		*Physical Capital Stock in Education (in crores of Rs.) at*			
		Education sector	*University*	*Col. 3 as % of Col. 2*			*Education*	*University*	*1960-61 Prices*		*Current Prices*	
		(in crores of Rs.)							*Lower limit*	*Upper limit*	*Lower limit*	*Upper limit*
	1	2	3	4	5	6	7	8	9	10	11	12
1.	1950-51	9.93	—	—	74·8	13·27	25.54	—	197·7	271·4	179.8	272.0
2.	1951-52	9.80	—	—	78.0	12·56	26·57	—	192.3	284.0	109.5	281.8
3.	1952-53	11.76	3.17	26.64	78.7	14.94	27.52	0.44	207.2	298.9	201.4	293.6
4.	1953-54	11.51	4.18	36.33	77·6	14.83	29.14	0.49	222.0	313.7	212.9	305.1
5.	1954-55	13.79	3.83	27.75	78.3	17.61	31.27	0.54	239.6	331.3	226.6	318.9
6.	1955-56	19.64	4.86	24.27	78·4	25.05	33.02	8.60	264·6	356·4	246.3	338.5
7.	1956-57	22.98	6.36	27·66	85·5	26.88	36.00	0.66	291.5	383.3	269·3	361·5
8.	1957-58	27.79	8·46	30.44	91·4	30·40	38.00	0.70	321·9	413.7	297.1	389.3
9.	1958-59	28.62	7.65	26.71	93.9	30·48	41.43	0.77	352.4	444.2	325.7	417.8
10.	1959-60	33.87	13·12	38.72	96.3	35·17	44.53	0.84	387.6	479.3	359·7	451.8
11.	1960-61	42.82	17.30	40.42	100·0	42.82	47·96	0.89	430.4	522.1	402.4	494.6
12.	1961·62	51.01	17·00	33.33	105.2	48.49	54.28	0.96	478.9	570.6	453.4	545·6
13.	1962-63	51·03	18·10	34.91	108.2	47.90	57·97	1.06	526.8	618.5	505.2	597.4
14.	1963-64	50.80	19·23	37.85	110.9	45·80	61.71	1·17	572·6	664.3	556 0	648.2
15.	1964-65	48·78	22.59	46·31	116·2	41.98	67.41	1.29	614·6	706.3	604.8	697·0
16.	1965-66	54·47	29.50	50.16	125.4	43·44	70·56	1.48	658.0	799.8	659.3	751.5

Sources : Cols. 2 & 7 : *Education in India*, Vol. II (1950-51 to 1964-65 and for 1965-66 from the orginal records of Ministry of Education.

Cols. 3 and 8 : *Education in Universities in India*, 1952-53 to 1964-65, and for 1965-66 from the original records of Ministry of Education.

Col. 5 : See footnote 19.

Col. 6 : Col. 2/Col. 5

Cols. 9 to 12 : See text.

The general trends in physical capital formation at current and 1960-61 prices during the three Five Year Plans can be seen from the table. The total gross physical capital formation in the education sector during the three Five Year Plans was of the order of Rs. 479.5 crores at current prices and Rs. 478.4 crores at 1960-61 prices. It is clear that the two estimates at current and constant prices are very close to each other and that the price movement during three Five Year Plans has made a difference of Rs. 1.1 crores between the two sets of estimates.

In cols. 6 and 7 of Table 8, capital cost per student place has been given by dividing the total gross capital formation during the periods (shown under cols. 4 and 5) by the net increase in the student places during the period. It is seen that the capital cost per student place at school stage was only of the order of Rs. 70.41 as against Rs. 1,565.6 per student place in the university sector. The two were in the ratio of 1:22. This shows the qualitative differences between the provision of educational facilities for students at school stage and students in higher education.

The capital stock in the education sector has been estimated under two assumptions:

(a) The capital cost per student place given in Table 8 for the school stage was multiplied by total enrolment in 1950-51 to obtain the base year physical *stock* in the whole educational system. To this the annual series of capital formation was added to arrive at growth in the total stock as shown in col. 11 of Table 7. This formed the lower estimate of the growth in physical capital formation.

(b) The capital cost per student place for all education given in Table 8 was multiplied by the total enrolment in 1950-51 to arrive at the total stock of physical capital in the base year. The annual series of capital formation was added to it to find that the growth in the gross stock of physical capital. This is shown in col. 12 of Table 7. This formed the upper limit of the growth in physical capital formation in education. The same procedure has been adopted for arriving at capital formation at constant prices of 1960-61 and shown in cols. 9 and 10 of Table 7.

TABLE 8

Capital Cost per Student Place at Current and 1960-61 Prices, 1951-1966.

Sl. No.	*Sector*	*Period*	*Net Increase in Enrolment Places (in millions)*	*Gross Physical Capital formation at*		*Capital Cost per Student at*	
				Current prices	*1960-61 prices*	*Current prices*	*1960-61 prices*
				in crores of Rs.		*in Rs.*	
	1	2	3	4	5	6	7
1.	Universities	1952-53 to 1965-66	1.12	175.35	—	1565.6	
2.	School Stage	—do—	41.80	294.33	294.16	70.41	70.38
3.	All Education	1951-52 to 1965-66	45.01	479.47	478.35	106.52	106.27

Source : As in Table 7

In the final year (i.e., 1965-66), it is seen that the lower limit of the physical capital stock at current prices in 1965-66 was 12.3 per cent less than the upper estimate of total physical capital stock in that year. It may be noted that while aggregating various components of costs and analysing the implication of growth in social costs of education, only the upper limit of capital cost has been taken into account. It is believed that it will take care of the capital formation due to public support, particularly in rural areas for elementary education, which is not reported in the published figures of the Ministry of Education.

Depreciation. Two sources for estimating the depreciation of the stock of physical capital have been examined. These are:

(a) Depreciation rates as used by the National Income Division of the CSO.

(b) Depreciation rate structure as adopted by the Income Tax authorities.

The CSO assumed an average length of life for *pucca* buildings to be 60 years and for *kucha* buildings to be 40 years. In other words, the depreciation rate varied from 1.67 per cent to 2.5 per cent (CSO, 1967, 63). On the other hand, the Income Tax authorities 'depreciation rates varied from 5 per cent with respect to second class buildings of less substantial construction, to 15 per cent for furniture and fittings', etc.[13]

Keeping in view the broad items included in the physical capital in the education sector, a 4 per cent rate of depreciation is assumed for the purpose of our calculations. The *constant method* for working out depreciation is applied because of its simplicity, and with the assumption that it would not make any appreciable difference in the final calculations if they were worked out by using other methods mentioned earlier.

Interest Rate. Kaushik (1969, 593) analysed the trends in structural changes in interest rates during the last decade. For 1965-66, these varied as under:

For industrial securities	6.96	per cent
Scheduled Indian commercial	4.79	—do—
Inter-bank call money rate	4.32	—do—
Bazaar bill rate	14.04	—do—

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[13] Government of India, *Gazette of India Extraordinary*, Part II-Section 3, No. 137, March 1962, pp. 634-5. Also see Appendix to the Income Tax Act of 1961.

Keeping in view these rates the 6 per cent prevailing bank rate in 1964-65 was adopted for computing national interest cost of capital used in educational sector. In short, a 10 per cent (4 per cent depreciation plus 6 per cent interest) rate of capital stock at current and constant prices in a given year was assumed to be the interest cost of capital employed in education.[14] The results are given in cols. 3, 4, 10 and 11 of the table.

(HOUSEHOLD) PRIVATE COSTS OF EDUCATION

Educational costs incurred by a household in educating a student are of following types:

1. Tuition cost
2. Non-tuition cost
3. Income forgone

Methods employed and trends in the growth in three components are given below.

1. *Tuition Costs.* Tuition costs and other fees paid by the students are indicated in col. 2 and scholarships received by the students from the educational institutions are shown in the col. 3 of Table 9. In the col. 4 net tuition fees at current price is given. With the help of 'consumer price index numbers' figures in col. 4 have been deflated to arrive at net tuition costs at 1960-61 price and figures are given in col. 5 of Table 9. It is seen that net tuition fees at current prices have increased from Rs. 19.9 crores in 1950-51 to Rs. 59.6 crores in 1965-66. The financial burden of the households in supporting education of their children has decreased through the scholarships and fee concessions and other assistance from Rs. 3.4 crores in 1950-51 to Rs. 38.4 crores in 1965-66, at the trend annual growth rate of 19.2 per cent. The gross volume of fee payments have increased from Rs. 23.3 crores in 1950-51 to Rs. 97.9 crores in 1965-66, at the trend annual growth rate of 9.6 per cent.

2. *Non-Tuition Costs.* Non-tuition costs incurred by the students (or by their parents) are on the items like transport, books and

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[14] This is in line with the procedure of the CSO (1967), namely "The gross rental of rural houses formed 10 per cent of the current value of houses."

TABLE 9

Net Private Tuition Cost of Education, 1950-51 to 1965-66

(In crores of Rs.)

S. No.	*Year*	*Total Fee Payment*	*Total Scholarships etc.*	*Net Private Tuition Cost col. 2-col. 3*	*Net Private Tuition Cost at 1960-61 prices*
	1	2	3	4	5
1.	1950-51	23.33	3.44	19.89	24.56
2.	1951-52	26.96	3.70	23.26	27.69
3.	1952-53	29.71	4.54	25.17	30.33
4.	1953-54	32.90	5.65	27.25	32.06
5.	1954-55	35.34	6.79	28.55	35.69
6.	1955-56	37.90	8.22	29.68	38.55
7.	1956-57	40.10	9.07	31.03	36.08
8.	1957-58	43.64	10.56	33.08	36.76
9.	1958-59	48.42	12.88	35.54	37.41
10.	1959-60	52.70	15.41	37.29	37.67
11.	1960-61	59.03	20.02	39.01	39.01
12.	1961-62	65.61	26.38	39.23	38.46
13.	1962-63	73.77	26.10	47.67	44.97
14.	1963-64	82.36	29.91	52.45	47.68
15.	1964-65	88.56	33.76	54.80	43.49
16.	1965-66	97.93	38.38	59.55	44.11

Sources : Ministry of Education, *Education in India,* Vol. II (1950-51 to 1964-65), and for 1965-66, figures have been compiled from original records.

Col. 5 : Figures in col. 4 have been deflated with the help of consumer price index numbers.

stationery, hostel charges, etc. An attempt has been made here to piece together information from sources of varying quality with respect to expenditure on books and stationery, consumed by students in school and higher stages of education. Some comments on the strength of sources of data and the methods employed for estimating non-tuition cost on books and stationery at school stage and higher educational level are briefly given below.

a. School Stage. In Table 10 cost of books and stationery for various stages of school education are given from the Report of the

TABLE 10

Estimates of Annual Non-Tuition Private Costs on Books and Stationery at School Stage Education, 1965

(*In Rs.*)

S. No.	*Stage of School Education*	*Education Commission's Estimated Expenditure on Textbooks and Stationery*			*Shah's Baroda Study Estimated Expenditure on Books and Stationery by Families having Annual Income*				*Estimated Expenditure for India*
		Lowest	*Highest*	*Ratio of cols. 3 : 2*	*Below Rs. 3600*		*Above Rs. 3600*		
					Lowest	*Highest*	*Lowest*	*Highest*	
	1	2	3	4	5	6	7	8	9
1.	Primary (1-V)	16.71	200.79	12	21.75	98.00	49.00	230.00	16.71
2.	Middle (VI-VIII)	38.90	416.41	11	23.00	90.00	58.00	190.00	90.00
3.	Elementary (1-VIII)	55.61	617.20	11	44.75	188.00	107.00	420.00	106.71
4.	High school (IX-X)	37.16	548.90	15	—	—	—	—	161.51
5.	Higher secondary (XI)	25.00	259.65	10	—	—	—	—	82.02
6.	School stage (I-XI)	117.77	1425.75	12	—	—	—	—	350.24
7.	Average per class	10.70	129.61	13	5.59	23.51	13.37	52.50	31.84

Sources : Cols. 2 and 3 compiled from *Report of the Education Commission, 1964–66* (p. 205), and Cols. 5 to 8 from Shah (1970, p. 70) and for figures in rows 4 and 5 under Col. 9., see *Report of the Education Commission 1964-66*, p. 216.

Education Commission (1964-66) and from the Baroda Study of Shah (1970). The Education Commission's Report gives the *lowest* and the *highest* expenditure rates on books and stationery and Shah's study gives in a similar manner, for families with annual income less than Rs. 3,600 and families having income more than Rs. 3,600. In 1964-65, 84.4 per cent of children in junior primary schools in India were studying in rural India.[15] Keeping in view general poverty conditions in the rural area, we assumed lower limit of costs for primary stage in the Education Commission's Report (col. 2) as the picture for the whole country. For the middle stage the ratio between the lowest and the highest estimates given by the Education Commission was of the order of 1:11. Therefore, we adopted upper estimate (col. 6) given under families having annual income less than Rs. 3,600. This estimated expenditure falls within the middle of the estimated expenditure given under Row 2 of the table. Regarding non-tuition expenditure by high and higher secondary students, we examined the parental income distribution of students benefiting from technical, vocational and professional higher education and found 75.7% of boys belong to families with annual income less than Rs. 3,600.[16] Therefore, weighted estimates of expenditure by high and higher secondary students were obtained by applying weights of 75.7:24.3 to the lower and upper estimates given in Rows 4 and 5 of the table, and these are shown in col. 9 of the table.

b. Higher Education. With respect to higher education, Khusro's (1967) estimates of 'educational expenses' for Delhi University students were assumed and given in the col. 3 of Table 11. 'Educational expenses' included expenditure on tuition and other fees, private tuition, stationery and books. With the help of 'consumer price index numbers', educational expenses were brought forward to 1960-61 price level (col. 4). From these figures tuition costs (col. 6) were excluded in order to arrive at non-tuition costs and results are given in the col. 7 of the table.

On the basis of estimated expenditure on non-tuition items, given in Tables 10 and 11 by stages and types of education for 1960-61 (also given in the first row of Table 12) and enrolment figures for corresponding levels of education, non-tuition costs of education have been estimated for three Five Year Plans and given in Table 12 (col. 8). It may be noted that assumed expenditure rates for 1960-61 at 1960-61 prices have been kept constant for all the 16 years, due to lack of information about increase or decrease in real terms during the period under discussion.

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[15] *Education in India*, Vol. II, 1964-65, 185.

[16] *Report of the Education Commission*, 1964-66. (Reprint edn., 1970, p. 216).

TABLE 11

Estimated Annual Non-Tuition Private Costs of Books and Stationery for General and Professional Higher Education, 1960-61

S. No.	*Type*	*Educational expenses by Delhi University students in*			*Annual fees per student in India*		*Estimated exp. on books and stationery 1960-61*
		1957-58		*1960-61*	*1964-65*	*1960-61*	
		No. of students	*average annual expenses*				
	1	2	3	4	5	6	7
1.	General higher education	1107	326.00	361.86	169.99	134.90	226.96
2.	Professional higher education, including law and diploma courses	183	409.00	454.40	156.73	124.39	330.01
3.	All higher education	1290	338.40	375.96	214.94*	170.59	205.37

*Includes university departments also

Sources : Cols. 2 and 3 are compiled from Khusro (1967, p. 59). Figures in Col. 4 are inflated by 11% increase in consumer price index during 1957-58 to 1960-61. Col. 6 : Figures in col. 5 have been deflated by 26% increase in consumer price index during 1960-61 to 1964-65. Col. 7 : Col. 3-Col. 6

TABLE 12

Non-Tuition Private Costs of Education at 1960-61 Prices

S. No.	Year	Enrolment (in Millions) Primary	Middle	High/Hr. Secondary	Technical & Vocational Education	General Higher Education	Professional Higher Education	Total Cost (In crores of Rs.)
	1	2	3	4	5	6	7	8
	Assumed cost per student (in Rs.)	2.47	22.22	60.13	60.76	226.96	330.01	
1.	1950-51	18.32	2.07	3.16	1.59	0.31	0.061	46.84
2.	1951-52	19.02	2.23	3.45	1.36	0.35	0.068	48.85
3.	1952-53	19.55	2.31	3.70	1.46	0.39	0.075	52.41
4.	1953-54	20.84	2.43	3.98	1.33	0.43	0.083	55.06
5.	1954-55	22.23	2.60	4.30	1.52	0.47	0.096	60.19
6.	1955-56	22.96	3.81	4.71	1.75	0.52	0.107	68.42
7.	1956-57	23.98	4.39	5.19	1.67	0.57	0.122	73.99
8.	1957-58	24.85	5.06	5.56	1.73	0.60	0.142	79.63
9.	1958-59	24.45	8.17	6.17	1.76	0.65	0.162	92.09
10.	1959-60	26.02	8.88	6.76	1.92	0.68	0.197	100.41
11.	1960-61	26.76	10.61	7.51	2.07	0.69	0.220	110.84
12.	1961-62	29.62	12.14	8.43	3.03	0.72	0.251	128.05
13.	1962-63	31.45	13.34	9.33	2.69	0.79	0.285	137.19
14.	1963-64	33.28	14.46	10.28	2.41	0.87	0.315	146.95
15.	1964-65	35.99	15.75	11.32	2.62	0.97	0.655	171.50
16.	1965-66	37.43	16.72	12.39	2.04	1.12	0.712	182.21
	Trend Annual Growth Rate	4.75	17.68	9.67	4.50	7.95	12.41	

Sources. : Cols. 2 to 7 : *Education in India*, Vol. II, 1965-66
Col. 8 : See text.

3. *Income Forgone.* Income forgone by students is an important item of private and social costs of education. It has been estimated by multiplying together following three factors:

(a) Number of students in a given level of education above the age of 14 years.
(b) Education specific working force participation rates.
(c) Wage rates of workers of comparable age and ability.

Estimation procedure about each element is discussed in the subsequent paragraphs.

Before we proceed to actual calculation, it may be pointed out that enrolment figures, given in official documents have certain element of upward bias. For example, in 1961 the Ministry of Education (*Education in India,* Vol. II) claimed that the size of educational system in India was of the order of 47.96 million as against 41.41 million revealed by Census operations in 1961. Thus, there was a deficit of 6.55 million students between two sources of data.[17] No doubt, some of the difference between two sets of figures could be explained due to the difference in the definition of students because Ministry of Education included part-time students in addition to full-time students. But, there seems reason to believe that enrolment figures are exaggerated due to the overenthusiasm of educational administrators and institutional heads with respect to their performance of 'enrolment drives' in their respective areas. From Table 13, the growth in enrolment in different levels of education may be noted. The higher stages have expanded faster than lower stages of education. This may be due to the more rapid increase in the number of students going for higher education after leaving school education. There are also structural changes in enrolment figures between 1950-51 and 1965-66 as can be seen from the cols. 4 and 5. The shifting enrolment from lower to higher stages of education is in line with the changes in allocation of expenditure on education as noted earlier. In short, it is seen that educational system has increased from 25.5 million in 1950-51 to 70.56 million in 1965-66.

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[17] Registrar General of India, *Census of India*, 1961, Vol. I, and Ministry of Education, *Education in India*, Vol. II, 1960-61. The bogus enrolment problem was officially recognised by the Government of India in *Progress of Education in India*, 1917-22, Vol. I, (1924, p. 104). In fact, the Agro-Economic Research Centre Study (1967) has analysed the extent of the upward bias in the primary stage of education by States for 1961.

TABLE 13

Trend Growth Rates in Enrolment by Types of Institutions in India, 1950-51 and 1965-66

S.No.	*Institutions*	*Enrolment (in millions)*		*Percentage Distribution*		*Trend Annual Growth Rate*
		1950-51	*1965-66*	*1950-51*	*1965-66*	
	1	2	3	4	5	6
1.	Primary	18.32	37.43	71.7	53.0	4.75
2.	Middle	2.07	16.72	8.1	23.7	17.68
3.	High/Hr. Secondary	3.16	12.39	12.4	17.6	9.67
4.	All school education (including vocational, technical and other schools)	25.14	68.59	98.4	97.2	7.37
5.	Colleges for general education	0.31	1.12	1.3	1.6	7.95
6.	Colleges for professional and technical education	0.06	0.71	0.2	1.0	12.41
7.	Higher education (Including university departments)	0.40	1.96	1.6	2.8	9.98
8.	All levels (school and higher education)	25.54	70.56	100.0	100.0	8.40

Sources : *Education in India*, Vol. II (1950-51 to 1964-65). For 1965-66, provisional figures have been compiled from the Ministry of Education.

In Table 14 enrolment figures have been given under school stage and higher education. In school education enrolment has been classified into two age-groups, namely, students below 14 and those above 14. Keeping in view the Constitutional Directive of Article 45 for free and compulsory education and the incapacity of children to participate actively in the world of work no opportunity cost of their time has been assumed. Therefore, we are left with the students who are over 14 years of age, either in school stage education or in higher education.

The next problem was to choose relevant participation rates for students, of Table 14 shown in cols. 3 and 4. These have been taken from the NSS reports and given in Table 15.

TABLE 14

Income Forgone (Opportunity Cost) by Students, at Current and 1960-61 prices, 1950-51 to 1965-66

S. No.	Year	Enrolment (in millions)			Wage Rates (Annual)				Income Forgone Adjusted for Education Specific Participation Rates (in crores of Rs.)			
		School Stage		Higher Education	Agricultural Sector		Manufacturing Sector		School stage	Higher education	Total Income Forgone at	
		Age below 14 years	Age above 14 years		Rate (Rs.) at current prices	Implicit price index	Rate (Rs.) at current prices	Implicit price index			Current prices	1960-61 prices
	1	2	3	4	5	6	7	8	9	10	11	12
1.	1950-51	20.74	4.40	0.40	472	97	1002	84	89.73	25.83	115.56	123.26
2.	1951-52	21.77	4.35	0.45	477	97	1091	89	89.60	31.39	120.99	127.64
3.	1952-53	22.40	4.62	0.50	451	90	1094	88	90.01	34.97	124.98	139.75
4.	1953-54	23.80	4.78	0.55	490	91	1136	87	101.25	40.15	141.40	157.41
5.	1954-55	25.30	5.35	0.62	396	74	1149	86	91.55	39.42	130.97	169.55
6.	1955-56	26.29	6.96	0.68	405	77	1170	85	121.68	42.77	164.45	208.35
7.	1956-57	27.63	7.63	0.75	486	97	1241	88	160.11	59.38	219.49	232.54
8.	1957-58	28.63	8.57	0.80	457	97	1291	93	169.17	66.22	235.39	245.60
9.	1958-59	28.75	11.81	0.88	430	96	1296	94	219.38	72.43	291.81	305.57
10.	1959-60	30.72	12.86	0.95	522	97	1356	96	290.02	82.19	372.21	384.59
11.	1960-61	32.02	14.96	0.99	564	100	1485	100	364.37	93.60	457.97	457.97
12.	1961-62	35.37	17.86	1.09	588	101	1595	106	453.62	110.41	564.03	553.30
13.	1962-63	37.77	19.04	1.16	551	103	1653	109	453.28	122.76	576.04	552.71
14.	1963-64	40.23	20.20	1.28	630	117	1732	110	549.82	141.44	691.24	598.51
15.	1964-65	43.23	22.44	1.74	796	138	1850	118	771.75	205.73	977.48	733.57
16.	1965-66	45.27	23.32	1.96	696	140	1979	124	701.23	247.84	949.07	700.74

Sources : Wage rates in agriculture and manufacturing along with their implicit price index numbers, with 1949-50 as base, have been taken from Mukherjee and Chatterjee (1968, p. 13 and 30) and age-distribution has been compiled from *Education in India*, Vol. II (1950-51 to 1964-65) ; for 1965-66 original records were used.

TABLE 15

Urban-Rural Participation Rates, 1958-59

S. No.	*Educational Level*	*Urban*	*Rural*	*Rates Assumed for the Present Study*
	1	2	3	4
1.	Below matric	36.15	46.27	43.36*
2.	Above matric	63.34	71.25	63.34**

*Weighted average of rural and urban participation rates has been given here. The weights chosen for urban and rural participation rates were proportions of school stage enrolment located in rural and urban areas in 1964-65, as given in *Education in India*, Vol. II (1964-65). Proportion of rural enrolment in 1964-65=71.2 per cent.

**Urban participation rate.

Source : Cols. 2 and 3 : NSS Report Nos. 87 and 88 (Fourteenth Round).

In col. 4 it is seen that urban and rural participation rates for workers, below matric have been weighted with the enrolment proportion from urban and rural areas in 1964-65. For the students in higher education the urban participation rate has been assumed to hold good. The participation rates given in col. 4 relate to the year 1958-59 which falls within the middle of the period 1950-56, covered in the study.

Third problem related to choice of appropriate wage rates for the enrolment at school stage and higher levels of education. As noted from Table 15, 71.2 per cent of the students in school stage education were reading in schools located in rural areas and wage rates of agricultural workers have been assumed for the students who have completed at least 14 years of age (col. 3 in Table 14). For students in higher educational levels (col. 4 of Table 14) wage rates of workers in manufacturing industries have been assumed. The wage rates, along with implicit price index numbers, given in cols. 5 to 8 of the table have been taken from the study by Mukherjee and Chatterjee (1968, 30).

By multiplying the enrolment figures given in cols. 3 and 4 of Table 14 education specific working force participation rates given in col. 4 of Table 15 and wage charts given in cols. 5 and 7 of Table 14, the income forgone at current prices by the students has been estimated and given in col. 11 of the Table 14. With the help of

TABLE 16

Estimated Private Cost of Education by Major Components at Current and 1960-61 Prices, 1950-51 to 1965-66

S. No.	Year	At Current Prices (In Crores of Rs.)					At 1960-61 Prices (In Crores of Rs.)				
		Net tuition cost	Non-tuition cost	Income forgone	Total	Col 4 as% of Col. 5	Net tuition cost	Non-tuition cost	Income forgone	Total	Col. 9 as% of Col. 10
	1	2	3	4	5	6	7	8	9	10	11
1.	1950-51	19.89	37.94	115.56	173.39	66.65	24.56	46.84	123.26	194.66	63.32
2.	1951-52	23.26	41.03	120.99	185.28	65.30	27.69	48.85	127.64	204.18	62.51
3.	1952-53	25.17	43.50	124.98	193.65	64.54	30.33	52.41	139.75	222.49	62.81
4.	1953-54	27.25	46.80	141.40	215.45	65.63	32.06	55.06	157.41	244.53	64.37
5.	1954-55	28.55	48.15	130.97	207.67	63.07	35.69	60.19	169.55	265.43	63.84
6.	1955-56	29.68	52.08	164.45	246.21	66.79	38.55	68.42	208.35	315.32	66.08
7.	1956-57	31.03	63.63	219.49	314.15	69.87	36.08	73.99	232.54	342.66	67.86
8.	1957-58	33.08	71.67	235.39	340.14	69.20	36.76	79.63	245.60	361.99	67.85
9.	1958-59	35.54	87.49	291.81	414.84	70.34	37.41	92.09	305.57	435.07	70.23
10.	1959-60	37.29	99.41	372.21	508.91	73.61	37.67	100.41	384.59	522.67	73.58
11.	1960-61	39.01	110.84	457.97	607.82	75.35	39.01	110.84	457.97	607.82	75.35
12.	1961-62	39.23	130.61	564.03	733.87	76.86	38.46	128.05	553.30	719.81	76.87
13.	1962-63	47.67	145.42	576.04	769.13	74.90	44.97	137.19	552.71	734.87	75.21
14.	1963-64	52.45	161.65	691.24	905.34	76.35	47.68	146.95	598.51	793.14	75.46
15.	1964-65	54.80	216.09	977.48	1248.37	78.30	43.49	171.50	733.57	948.56	77.34
16.	1965-66	59.55	245.98	949.07	1254.60	75.65	44.11	182.21	700.74	927.06	75.59

Sources : *Col. 2* : Col. 4 of Table 9
Col. 3 : Figures in col. 8 inflated with the help of consumer price index numbers with base 1960-61=100
Col. 4 : Col. 11 of Table 14.
Col. 7 : Col. 5 of Table 9
Col. 8 : Col. 8 of Table 12
Col. 9 : Col. 12 of Table 14

price deflators, income forgone at 1960-61 prices has been estimated and given in col. 12 of Table 14. It is observed that the income forgone at current prices has increased from Rs. 115.6 crores in 1950-51 to Rs. 949.1 crores in 1965-66. At 1960-61 prices the income forgone has increased from Rs. 123.3 crores to Rs. 700.7 crores during the same period.

MAJOR TRENDS

In the end let us analyse the major trends revealed by the estimated private and social costs of education during three Five Year Plans. These are analysed under the following heads:

1. Private costs of education
2. Social costs of education
3. Growth in social cost per student year
4. Social costs of education and macro-economic aggregates.

Private Costs of Education. Costs of education directly financed by the household in educating the children are given in Table 16 at current and 1960-61 prices. Total private costs at current prices have risen from 173.4 crores in 1950-51 to Rs. 1,254.6 crores in 1965-66, a little over seven-fold increase during the 16 years' period. At the 1960-61 prices, these costs have risen from Rs. 194.7 crores in the base year to Rs. 927.1 crores in the final year, 4.8 times increase during the period under review. Difference between two sets of figures is due to increase in price level during the period.

Structural changes in the private costs between the base and the final year is given in Table 17.

Income forgone formed 66.7 per cent of the total private costs at the current prices in the base year and rose to 75.7 per cent in the final year. The share of net tuition cost was 11.5 per cent in the base year and declined to 4.8 per cent in the final year. Similarly, non-tuition cost has declined from 21.9 per cent to 19.6 per cent during the same period. On the other hand, there has been an upward increase in the share of opporutnity costs (income forgone). This implies that student contribution in terms of their own time and effort is becoming more and more prominent in the private costs of education. It is therefore clear that income forgone, ignored so far in the

TABLE 17

Structural Changes in Private Costs of Education, 1950-51 and 1965-66

(Amount in crores of *Rs.*)

S.No.	*Item*	*1950-51*		*1965-66*	
		Amount	%	*Amount*	%
	1	2	3	4	5
1.	Net tuition cost	19.89	11.47	59.55	4.75
2.	Non-tuition cost	37.94	21.88	245.98	19.61
3.	Income forgone	115.56	66.65	949.07	75.64
4.	Total	173.39	100.00	1254.60	100.00

Source : As in Table 16, cols. 2 to 5

cost analysis of education, is an important resource used up in the production of human capital.

Social Costs of Education. In Table 18 various elements of social costs of education have been put together at current and 1960-61 prices. It may be noted here that private costs as a part of social costs shown in the table include all items except transfer payments (net fee payments) and under capital costs rental value of only upper estimate of the total stock of physical capital employed in education is shown.

It is seen that social costs at current prices have increased from Rs. 281.7 crores in 1950-51 to Rs. 1790.5 crores in the final year, and at 1960-61 prices they have increased from Rs. 321.9 crores to Rs. 1,350 crores during the same period. It is seen that educational expenditure in 1965-66 as shown in the records of the Ministry of Education was only Rs. 622 crores as against the total social cost of Rs. 1,799 crores, as estimated in the present investigation. Thus, it is clear that about two-thirds of the total educational costs are not reported in the expenditure statistics published by the Ministry of Education (*Education in India, Vol. II*).

In Table 19 structural changes of social costs during the base year, Plan periods and final year are given. It is seen that current costs formed 38.3 per cent in the First Plan and only 29.4 per cent in the Third Plan. The share of capital costs has gone down from 8.9 per cent to 4.6 per cent during the same period. Non-tuition costs

TABLE 18

Social Costs of Education at Current and 1960-61 Prices, 1950-51 to 1965-66

(Amount in crores of Rs.)

	At Current Prices							At 1960-61 Prices						
	Institutional cost			Private cost		Total social cost		Institutional cost			Private cost		Total social cost	
		Capital cost							Capital cost					
S. No. Year	Current cost	Lower limit	Upper limit	Non-tuition cost	Income forgone	Lower limit	Upper limit	Current cost	Lower limit	Upper limit	Non-tuition	Income forgone	Lower limit	Upper limit
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. 1950-51	101.00	17.98	27.20	37.94	115.56	272.48	281.70	124.69	19.77	27.14	46.84	123.26	314.56	321.93
2. 1951-52	105.06	10.95	28.18	41.03	120.99	278.03	295.26	125.07	19.23	28.40	48.85	127.64	320.79	329.96
3. 1952-53	121.34	20.14	29.36	43.50	124.98	309.96	319.18	146.19	20.72	29.89	52.41	139.75	359.07	368.24
4. 1953-54	131.09	21.29	30.51	46.80	141.40	340.68	349.80	154.22	22.20	31.37	55.06	157.41	388.89	398.06
5. 1954-55	144.42	22.66	31.89	48.15	130.97	346.20	355.43	180.52	23.96	33.13	60.19	169.55	434.22	443.39
6. 1955-56	161.81	24.63	33.85	52.08	164.45	402.97	412.19	210.14	26.46	35.64	68.42	208.35	513.37	522.55
7. 1956-57	174.25	26.93	36.15	63.63	219.49	484.30	493.52	202.61	29.15	38.33	73.99	232.54	538.29	547.47
8. 1957-58	202.30	29.71	38.93	71.67	235.39	539.07	548.29	224.77	32.19	41.37	79.63	245.60	583.19	591.37
9. 1958-59	217.64	32.57	41.78	87.49	291.81	629.51	638.72	229.09	35.24	44.42	92.09	305.57	661.99	671.17
10. 1059-60	251.12	35.97	45.18	99.41	372.21	758.71	767.92	253.65	38.76	47.93	100.41	384.59	777.41	786.58
11. 1960-61	281.54	40.24	49.46	110.84	457.97	890.59	899.81	281.54	43.04	52.21	110 84	457.97	893.39	902.56
12. 1961-62	323.23	45.34	54.56	130.61	564.03	1063.21	1072.43	316.89	47.89	57.06	128.05	553.30	1046.13	1055.30
13. 1962-63	363.82	50.52	59.74	145.42	576.04	1135.80	1145.02	343.22	52.68	61.85	137.19	552.71	1085.80	1094.97
14. 1963-64	403.41	55.60	64.82	161.65	691.24	1311.90	1321.12	366.73	57.26	66.43	146.95	598.51	1169.45	1178.62
15. 1964-65	451.96	60.48	69.70	216.09	977.48	1706.01	1715.23	358.09	61.46	70.63	171.50	733.57	1325.32	1334.39
16. 1965-66	529.27	65.93	75.15	245.98	949.07	1790.25	1799.47	392.05	65.80	74.98	182.21	700.74	1340.80	1349.98

Sources : *Col. 2* : Col. 7 of Table 5
Cols. 3 and 4 : See Cols. 11 and 12 of Table 7
Cols. 5 and 6 : Cols. 3 and 4 of Table 16
Col. 9 : Col. 9 of Table 5
Cols. 10 and 11 : Cols. 9 and 10 of Table 7
Cols. 12 and 13 : Cols. 8 and 9 of Table 17.

TABLE 19

Growth in Social Cost of Education at Current and 1960-61 Prices, 1950-51 to 1965-66

(in crores of Rupees)

S.No.	*Year/Plan*	*At Current Prices*				*Social Cost*		*Col. 7/ Col. 6*
		Institutional Cost		*Private Cost*		*Current prices*	*1960-1961 prices*	
		Current cost	*Capital cost*	*Non-tuition cost*	*Income forgone*			
	1	2	3	4	5	6	7	8
	1950-51							
1.	Amount	101.00	27.20	37.94	115.56	281.70	321.93	
2.	Per cent	35.85	9.66	13.47	41.02	100.00		114.3
	First Plan							
3.	Amount	663.72	153.79	231.56	682.79	1731.86	2062.20	
4.	Per cent	38.32	8.88	13.37	39.43	100.00		119.1
5.	Annual geometric growth rate	.62	4.45	6.52	7.35	7.94		
	Second Plan							
6.	Amount	1126.85	211.50	433.04	1576.87	3348.26	3499.15	
7.	Per cent	33.65	6.32	12.93	47.10	100.00		104.5
8.	Annual geometric growth rate	11.68	7.91	16.30	23.00	16.85		
	Third Plan							
9.	Amount	2071.69	323.97	899.75	3757.86	7053.27	6013.26	
10.	Per cent	29.37	4.59	12.76	53.28	100.00		85.0
11.	Annual geometric growth rate	13.40	8.70	17.30	15.60	14.90		
	1965-66							
12.	Amount	529.27	75.15	245.98	949.07	1799.47	1349.98	
13.	Per cent	29.41	4.18	13.67	52.74	100.00		75.0

Source : As in Table 18.

TABLE 20

Growth in Cost per Student Year at Current and 1960-61 Prices, for 1950-51, 1955-56, 1960-61 and 1965-66

(In Rs.)

S. No.	Year	Enrolment (in millions)	At Current Prices					At 1960-61 Prices				
			Institutional cost		Private cost		Total Social cost	Institutional cost		Private cost		Total Social cost
			Current cost	Capital cost	Non-tuition cost	Income forgone		Current cost	Capital cost	Non-tuition cost	Income forgone	
	1	2	3	4	5	6	7	8	9	10	11	12
1.	1950-51	25.54	39.55	10.65	14.86	45.25	110.31	48.82	10.63	18.34	48.26	126.05
2.	1955-56	33.92	47.70	9.98	15.35	48.48	121.51	61.95	10.51	20.17	61.42	154.05
3.	1960-61	47.96	58.70	10.31	23.11	95.49	187.01	58.70	10.87	23.11	95.49	188.17
4.	1965-66	70.56	75.01	10.65	34.86	134.50	255.02	55.56	10.63	25.82	99.31	191.32
5.	Annual Geometric Growth Rate	7.01	4.38	—	5.83	7.83	5.75	0.88	—	2.38	4.95	2.83

Source : As in Table 18

have remained almost stable during all the three plans. The income forgone has gone up in relative terms from 39.4 per cent in the First Plan to 53.3 per cent in the Third Plan. It is also noted that private costs constituted 52.8 per cent in the First Plan and 66.0 per cent in the Third Plan. *It is, therefore, clear that private participation has gone up during the three Five Year Plans. This trend is opposite to what was noted earlier* (Pandit, 1971). *On the basis of expenditure figures, as published by the Ministry of Education, once again we emphasise how important the analysis of costs of education is as against the analysis based on 'expenditure figures'.*

Cost per Student Year. In Table 20 cost per student year has been given both at current and constant prices. While working out cost per student year, social costs in a given year have been divided by total enrolment. On an average, the cost per student year has increased by 5.75 per cent at current prices and 2.83% at 1960-61 prices. Thus the difference between the two growth rates (i.e., about 2.92 per cent) has been attributed to the upward rise in price. It is disturbing to note that capital cost per student year has remained constant during all the years. This implies that *quality input* in educational process per student has not improved during the three plans.

(iv) *Social Costs and Macro Economic Aggregates.* In the end, it is appropriate to relate the total social costs of education with macro-economic aggregates like total resource of the economy, national consumption expenditure and gross domestic physical capital formation. In order to keep comparisons in line with national income accounting procedures, it is seen from Table 21 that relationships have also been given after making necessary adjustments for income forgone by the students.

The following are the main trends observed from the relationships given in Table 21.

1. Out of total resources of the economy at current prices the share of education increased from 1.7 per cent in the base year to 3.5 per cent in the final year. A similar trend is observed when the relationship is worked out on the basis of the constant prices of 1960-61. *In other words, education has been taking an increasing share of the total resources of the economy.*
2. When income forgone (opportunity cost of students' time)

TABLE 21

Social Costs of Education and Macro Economic Aggregates at Current and 1960-61 Prices

(Amount in crores of Rs.)

S. No.	*Item*	*1950-51*	*1955-56*	*1960-61*	*1965-66*
	1	2	3	4	5
1.	*Total resources of the economy at*				
	i. current prices	9571	10,435	15,545	24,622
		(9687)	(10,599)	(15,993)	(25,571)
	ii. 1960-61 prices	9359	11,501	15,545	18,261
		(9482)	(11,709)	(16,003)	(18,962)
2.	*National consumption expenditure at*				
	i. current prices	8333	8,614	12,388	19,055
	ii. 1960-61 prices	7749	9,180	12,338	13,689
3.	*Gross domestic capital formation at*				
	i. current prices	952	1,405	2,401	4,269
	ii. 1960-61 prices	1243	1,721	2,401	3,450
4.	*Resources cost (excluding income forgone) of education at*				
	i. current prices	166.14	247.74	441.84	850.40
	ii. 1960-61 prices	198.67	314.20	444.59	649.24
5.	*Resources cost (including income forgone) of education at*				
	i. current prices	281.70	412.19	899.81	1799.47
	ii. 1960-61 prices	321.93	522.55	902.56	1349.98
6. (a)	*Ratio elasticities of resources cost (row 4) in relation to total resources (row 1) at*				
	i. current prices	1.74	2.37	2.84	3.45
	ii. 1960-61 prices	2.12	2.73	2.86	3.56
(b)	*Resources cost (row 5) in relation to total resources (row 1) adjusted for income forgone at*				
	i. current prices	2.91	3.89	5.63	7.04
	ii. 1960-61 prices	3.40	4.46	5.64	7.38
(c)	*Resources cost (row 4) in relation to consumption expenditure (row 2) at*				
	i. current prices	1.99	2.88	3.57	4.46
	ii. 1960-61 prices	2.56	3.42	3.60	4.74

TABLE 21 (*Contd.*)

1	2	3	4	5
(d) *Resources cost of education (row 4) and physical capital formation (row 3) in relation to total resources of the economy (row 1) at*				
i. current prices	11.68	15.84	18.29	20.79
ii. 1960-61 prices	15.41	17.69	18.31	22.44
(e) *Resources cost of education (row 5) and physical capital formation (row 3) in relation to total resources (row 1) adjusted for income forgone at*				
i. current prices	12.74	17.14	20.64	23.73
ii. 1960-61 prices	16.50	19.16	20.65	25.31

Notes

(i) Total resources = Gross Domestic Product (GDP) at market prices + Net Capital Inflow.

(ii) Consumption expenditure = GDP at market prices − gross capital formation + import of goods and services − export of goods and services

(iii) Figures in brackets in row 1 include income forgone by students

Sources

(i) GDP series at market prices at current prices has been taken from annual publications of the CSO on national product GDP series at 1960-61 prices have been arrived by applying the price trend implicit in GNP at current and 1960-61 prices given in Lal (1970).

(ii) Net Capital Inflow series at current prices have been adopted from the CSO (1967-68)

(iii) Capital formation series at current prices have been adopted from Lal (1970), and at 1960-61 prices from the CSO (1969) and Tiwari (1968).

Rows 4 and 5 : As in Table 17

is included in the total resources and in total costs of education, the proportion of total resources devoted to education increased from 2.9 per cent in the base year to 7.0 per cent in the final year. This shows the importance of the inclusion of income forgone as an item of cost and gives the real picture of the total resources allocated to education.

3. If education is treated as consumption expenditure even then the Indian society as a whole has shown preference to education as compared to other forms of consumption. It is clear that the share of consumption expenditure devoted to education increased from 2.0 per cent in the base

year to 4.5 per cent in the final year. This relationship does not take into account the income forgone by the student.

4. Finally, the combined investment in education and physical capital formation has been put in relation to the total resources of the economy. The share of total investment has increased from 11.7 per cent in the base year to 20.8 per cent in the final year. Again, these ratios do not include income forgone by the students. It is clear from the upward increase in the proportion of resources allocated to investment that India has been stepping up investment efforts both in physical and human capital at an increasing rate. The picture is more encouraging when ratios adjusted for income forgone are seen. The investment ratio increased from 12.7 per cent in the beginning to 23 per cent in 1965-66.

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Some Economic Aspects of Preprimary Education

Ramesh Chandra

The author stresses the importance of investment in preschool education and outlines an economic analysis of preprimary education in India.

The object of this paper is to outline an economic analysis of the preprimary education in India. The application of principles of economics in education has so far remained a virgin area and people have paid scant attention to it. In recent years some prominent economists like Prof. T.W. Schultz, Gary S. Becker, John Vaizey and in India Prof. V.K.R.V. Rao, Dr. A.K. Sen, Dr. A.M. Nallagounden, etc., have started taking lively interest in the field of economics of education. But these economists too have not, unfortunately, taken preschool education as a point of their main discussion. It appears that education in terms of economics was not liked a few decades back as Prof. T.W. Schultz (Professor of Economics, University of Chicago, U.S.A.) remarks "...an essay on the economic value of education will seem presumptuous to many school people and to some economists. Those who value schooling highly, which includes most of those who are a part of the educational establishment, are likely to look upon an effort such as this as an intrusion which can only debase the cultural purposes of education. In their view education lies be-

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yond the economic calculus. . . ."[1] In the same way, a modern educationist and social reformer Lala Lajpat Rai wrote, "In season and out of season we have been told that knowledge should not be sought for and judged by its money value. . . .To me it seems that this whole idea is the result of defective thinking."[2] He advocated the economic value of education and stressed that education besides many angles should also be looked from economic viewpoint. Consequently both economists and educationists ". . .long mutually mysterious and at times even hostile to one another—have lately embarked on the joint venture of discovering new insights into the economic aspects of education, external and internal. The progress they have made—though still limited—is sufficient to bring us together today."[3] And this is surely a significant development in the field of education.

Preschool Education as an Investment in the Child

The child as we know is the part of 'human wealth'. Human wealth can be increased by investing in man at different periods of life. "It is a simple truth that people invest in themselves and this investment can augment the amount of human wealth." Among the different investments which a man makes in himself, education appears to be the most important of all the stages of his life. This form of investment has many advantages but unfortunately it has not been well recognized. The traditional belief was that ". . .national wealth is almost wholly restricted to the non-human components, that is, to reproducible physical capital and land. The study of human wealth is everywhere neglected notwithstanding its importance and notwithstanding the fact that people all about us are investing in themselves."[4]

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[1] T.W. Schultz, "Education as Investment in People", *Education and the Development of Nations*, J.W. Hanson and C.S. Brembeck (Eds.), New York: Holt, Rinehart and Winston, 1966, p. 127.

[2] Lajpat Rai, *The Problems of National Education in India*, New Delhi: Publications Division, Ministry of Information and Broadcasting, Govt. of India, 1966, p. 94.

[3] Address given by Phillip H. Coombs at the opening session of the Policy Conference on Economic Growth and Investment in Education held at Washington from 16 to 20 October 1961, published by OECD, Dec. 1965; p. 25.

[4] T.W. Schultz, "Investment in Man: An Economist's view". In *Readings in the Economics of Education*, Unesco, Paris, 1968, p. 69.

Why we are so much reluctant in accepting education as an 'investment' is not due to the weakness of the concept but because we "cannot easily rise above our values and beliefs." The concept of human capital which has now been used in economics is quite different from material capital and is an explanation that economic development is not possible only by investing in traditional factors of economic growth. So far"...most of the economic literature on development continues to be based on the notion that physical investment is the engine of development, there are today an increasing number of economists who denounce that view and who regard development, particularly in underdeveloped countries, as primarily an educational process.'"[8]

The investment of preschool education in a child is meant to develop him after a certain age as a 'productive social human being' and thus to increase the human wealth. On this ground, it may be called as long-term investment. Education, by and large, is a long-term investment but preschool education is still more so in the sense that its returns are recognised late in life. Even then it forms the basis of future investment. "For a large segment of our population the ability to succeed in the early years of school is so crucial that it determines in essence what the person is going to be. It determines whether he is going to be a normally productive self-determining person.... If we can't provide nursery school, the means by which a child can go on and become an effective learner, then we have missed the boat.'"[9]

Therefore, child education should not be treated as a tool for increasing production, but the only way of producing a fully developed human being. When we say that preschool education is an investment, our emphasis is that this education, besides many other things, also helps the child to emerge as a productive human being in the years to come. Preschool education which imparts many good habits and skills is also important from the investment point of view. "Imagine how much lower our productivity would be if we were not to transmit to children by means of education the innumerable habits, skills, values and customs on which our civilization rests and which we take for granted."[7]

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[8] Gunnar Myrdal, *Asian Drama: An Inquiry into the Poverty of Nations*, Vol. III, London, Allen Lane, The Penguin Press, 1968, p. 1542-43.

[9] Quoted in Seymour L. Wolfbein, *Education and Training for Full Employment*, Columbia University Press, New York, 1967, pp. 79-80.

Preschool education is necessary for human resource development which in the end helps in economic growth. The "human resources are developed in many ways" and education is one of them. Education in relation to human resources is a 'continuous process' and starts from the first level of education to higher education and other programmes like 'on the job training', etc. Thus the foundation of human resource development in the context of education starts from preprimary education. At this stage the child's emotions are to be channelised in a proper way and set in the right direction. The job at this crucial point is a very difficult one but at the same time very important for society. N.S. Light remarks: "Certainly the emotional development of the child is of the greatest importance to him and to society, and yet, educationally, little is known about it and still less is done about it."[8]

The Economic Factor in Child Development

Just as emotional factors are little known to the educationists, economic factors in the child development are still less known to economists. A symposium on child development observed: "....the economic status can affect personality development directly and indirectly. Directly, it introduces physical facilities..... Indirectly, it may influence by affecting the parent personalities...different social and economic backgrounds bring the child into contact with different schools, different types of neighbours, etc., all of which affect personality development."[9]

Economists have paid little attention in solving the immediate economic problems relating to children. The truth is that the child in the eyes of economists is a dependent unit and hence deserves no independent thinking. Various commissions and committees of economists are busy in raising the economic development of our country in which their attention is mostly drawn to the problems of adult population. Hardly any economist is devoting his attention to the problems of educaion, food, living conditions, etc., of children which constitute a significant proportion of total population and more so in economically backward countries like ours.[10] This is really a grave economic problem and needs immediate attention. It is suggested that the welfare of the child should not be linked with the welfare of parents; in other words, it would be wrong thinking that improvement in the economic lot of parents would necessarily bring improvement in solving the economic problems of children. The time has come when parent and child should be treated as independent units, and their economic problems should also be treated independently. This thinking would pave the ground for sufficient allocation of resources to the needs of children from the exchequer of the government. It is desirable to break the existing traditional line of allocation of resources for the purpose of preparing the child from early days as a developed human being who may able to contribute to economic growth.

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[7] Ernest Van Den Haag, *Education As An Industry,* Augustus M. Kelley, New York, 1956, p. 22.

[8] Nelson B. Henry (Ed.), *The Forty-sixth Year Book of NSSE. Pt. II, (1947), Early Child Education,* University of Chicago Press, Illinois, 1956, p. 3.

[9] E.G. Parameswaran, Environmental Influence on Child Develoment. In *Child Development: A Symopsium,* NCERT, New Delhi, 1964, p. 242.

Returns on Preprimary Education

At the very outset it may be pointed out that economists give too much emphasis to measuring the returns on education. Such a numerical analysis at every point in the educational structure and at every stage of education is neither possible nor desirable. The unlimited jargon of numerical analysis even in subjects like education is the product of a few modern economists who often do harm to the discipline. Jagdish Bhagwati, an eminent Indian economist, writes: "It has even currently become fashionable to compute measures of the 'rate of return' on 'investment' in education. These measures, however, are based on inadequate theories which overlook many important effects of education. Nor do they distinguish between different *types* of education. This latter deficiency is quite serious and, if carried over to the field of educational planning, will produce disastrous results.'"[11] Earlier economists, also, like Alfred Marshall wrote: "The wisdom of expending public and private funds on education is not to be measured by its direct fruits alone. It will be profitable as a mere investment to give masses of the people much greater opportunity than they can generally avail themselves. And the economic value of one great industrial genius is sufficient to cover the educational expenses of a whole town...."

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[10] "While making a comparative study of the age cohorts of the population of a large number of countries, it was found that the proportion of young population in the less developed countries is more predominant." See: *The Ageing Population and its Economic and Social Implications,* United Nations, Department of Economic and Social Affairs, New York, 1956.

The returns on preprimary education, "important, though frequently intangible" accrue to the child and the society and are generally difficult to measure in economic terms. Hence, we can say the returns on preschool education have the distinct feature that they are by and large non-measurable. From this it may not be concluded that preschool education is not useful from the economic viewpoint. Firstly, this education is the initial step towards the preparation for life and makes the child accustomed to continue his further schooling. Like any other industry which requires some essential investment before starting the actual production, education industry also behaves in the same manner and needs this investment. At the most, the immediate returns if we want to explain would be "the enjoyment derived by the students from the process of education." Secondly, its returns are more visible in the latter part of life and in the latter stages of education like primary, secondary and higher education. As observed by Mrs. Muralidharan: "To get the maximum return from the investment in primary and secondary education it is imperative that the state pays adequate attention to preprimary education."[12] In any way these returns on preprimary education are no less important, because they form the sound basis of getting better returns in the later part of life. "Modern researches have shown that the years between three and ten are of the greatest importance in the child's physical, emotional and intellectual development. It has also been found that children who have been to a preprimary school show better progress at the primary stage and help in reducing wastage and stagnation.'"[3]

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[11] Jagdish Bhagwati, *The Economics of Underdeveloped Countries*, World University Library, London, 1966, p. 179.

[12] Rajalakshmi Muralidharan, 'Identification of the Main Problems and Questions of Major Policy in Pre-Primary Education—A Working Paper, *Pre-School Issue*, Faculty of Home Sciences, M.S. University, Baroda, 1969.

While there are many advantages to the child in giving him preschool education, it also helps in increasing the production of a country. The plenty of creches, day care centres and nursery schools release womanpower to work for the nation's economic development. It also helps in increasing the household income. The economic pressure has compelled mothers to take jobs and thus increase their family income to feed and educate their children well.

For a developing country, it is necessary that its population should not fear migration. Perhaps this is more true of the 'skilled' section of the population who go to different parts of the country for helping the regional economic growth. Such migrations become feasible when there are a number of nursery schools with hostel facilities. The parents can come and see their wards at regular intervals.

The increasing population in cities has compelled the families to live in small apartments which do not have sufficient room for a child to move and play in. The nursery schools provide this facility and help in the physical growth of the child which, in turn, is also necessary for the development of the country.

II

After discussing some concepts of economics which may be applied in preprimary education, we will examine various economic inputs needed for this stage of education. In this section our attempt will also be to produce some empirical data with regard to these factors.

"We begin with students because they are the prime inputs of any educational system. Their development is its prime object, their attitudes greatly affect its process and in the end they are its prime outputs."[4] The input of students at preprimary stage is more deli-

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[3] *Report of the Education Commission (1964-66)*, Ministry of Education, Delhi, 1966, p. 148.

[4] Philip H. Coombs, *The World Education Crisis: A Systems Analysis*, Oxford University Press, London, 1968, p. 17.

TABLE 1

Preprimary Education (Data for all India)

Year	*Number of Schools*	*Percentage increase (or decrease) over previous period*	*Number of students on rolls**	*Percentage increase (or decrease) over previous period*	*Number of teachers*	*Percentage increase (or decrease) over previous period*	*Teacher pupil ratio*	*Direct expenditure (Rs. in lakhs)*	*Percentage increase (or decrease) over previous period*	*Per student direct expenditure (Rs.)*
1	2	3	4	5	6	7	8	9	10	11
1950-51	303	—	21,640	—	866	—	1 : 25	11.98	—	55.36
1955-56	630	107.92	45,828	111.77	1,880	117.09	1 : 24	24.99	106.6	54.53
1960-61	1,909	203.01	1,21,184	164.43	4,007	113.13	1 : 30	58.73	135.0	48.46
1961-62	2,240	17.33	1,48,866	22.84	4,895	22.16	1 : 30	74.91	27.0	50.32
1962-63	2,502	11.69	1,64,595	10.56	5,221	6.65	1 : 32	82.31	9.9	50.00
1963-64	2,710	8.31	1,78,780	8.61	5,449	4.36	1 : 33	92.10	11.9	51.52
1964-65	2,898	6.93	2,34,268	31.03	6,352	16.57	1 : 37	100.0	8.6	42.69

*Excludes pupils in institutions attached to the primary and secondary schools.

Sources : (1) *India 1968*, Publications Division, Ministry of Information & Broadcasting, Govt. of India, December 1968, p. 63, for Cols. 1, 2, 4, 6 and 9.

(2) Remaining cols. have been worked out.

cate in comparison to other stages of education and thus needs careful handling. As shown in Table 1, the number of students on rolls in 1950-51 was 21,640 which rose to 2,34,268 in 1964-65. The percentage increase in five-year intervals, i.e., between 1950-51 to 1955-56 and 1955-56 to 1960-61 was respectively 107.92 and 203.01. But this increase does not give us a clear picture, hence per-year increase was worked out from 1960-61 for a clear understanding. A similar exercise could not be done for the period 1950-51 to 1960-61 as the yearly data was not available.

If we take 1960-61 as the base year, the percentage increase of the students in the following years was uneven. In 1961-62 it was 22.84 per cent but decreased in the following two years and then again showed a speedy increase to 31.03 per cent in 1964-65. From this it may be concluded that there is an increase in enrolment figures but it does not form a straight upward trend curve as shown in the diagram. In fact the students' curve falls sharply first and again takes a speedy upward trend.

The figures of enrolment shown in the table are only of recognised preprimary schools and do not include enrolment of those institutions which are affiliated to primary or secondary schools. Equally it appears from the figures that they do not include the enrolment of a large number of Balwadis working in the rural areas.[1]

The number of schools had also increased from 303 (1950-51) to 2,898 (1964-65) but the percentage increase per year as calculated from the base year 1960-61 shows a downward trend curve. This could be further checked from the diagram that the school curve shows a slow downward fall. At this point it would be interesting if we examine the percentage increase or decrease in students' enrolment vis-a-vis number of schools. It is clear from the percentage figures that there were significant differences in increase in these two inputs in the year 1961-62, but the decrease in the following years was more or less of the same order. In 1964-65 the trend of these two factors was in the opposite direction; while the percentage decrease in

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[1] "The working group on preprimary education of the Education Commission (1964-66) also has estimated 'about 20,000 Balwadis with a total enrolment of about 6,00,000 students." However, these are estimated figures from unpublished sources.

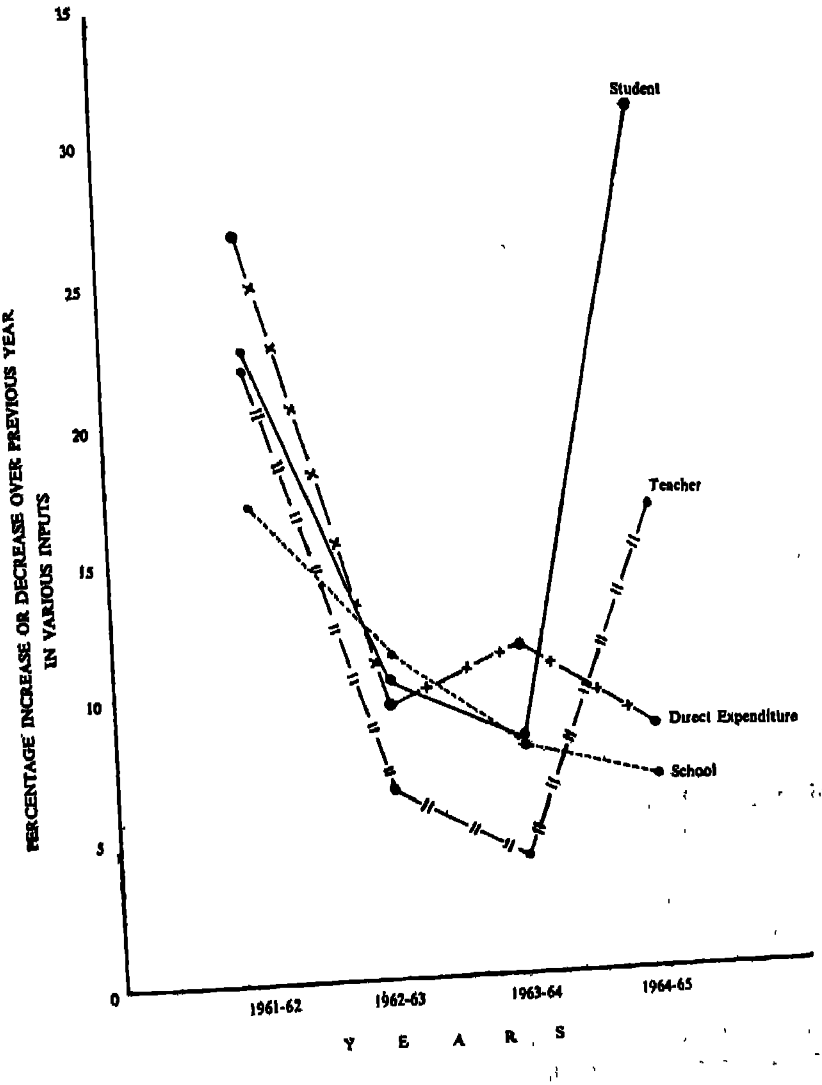
PERCENTAGE INCREASE OR DECREASE OVER PREVIOUS YEAR
IN VARIOUS INPUTS
35
30
25
20
15
10
5
0
Student
Teacher
Direct Expenditure
School
1961-62
1962-63
1963-64
1964-65
Y E A R S

Fig. 1

schools was 6.93, the increase in enrolment was 31.03 per cent. From this it may be inferred that this rate would not ultimately result in overcrowded schools. An overcrowded preprimary school loses the basic purpose for which it stands—'special care to every child'.

"Teachers, next to students, are the most crucial inputs of an educational system." Taking 1960-61 as the base year, the percentage increase of the teachers was uneven in the successive years. In 1962-63 and 1963-64, the number of teachers declined but in the year 1964-65 it showed a significant increase. The curve plotted in the diagram also shows speedy downfall; than slow fall and, further, a speedy increase in more or less the same manner as the decrease.

The trend in the growth of teachers did not keep pace with the increase in students' enrolment, resulting in the high teacher-pupil ratios. It is clear from the table that the teacher-pupil ratio is showing continuous increase marking 37 students against one teacher in the year 1964-65. It appears to be difficult to handle 37 students for a single teacher, specially in the preprimary stage where each student needs special care. One should not overlook the danger of neglect to the student that may result in making him introvert or hostile in the latter years of his life.

We now turn to the financial inputs which form the very basis of the education industry. The direct expenditure has increased from Rs. 12 lakhs in 1950-51 to Rs. 1 crore in 1964-65. Though in absolute terms there was a continuous increase in the expenditure, the percentage increase over the previous years calculated from 1960-61 shows a downward trend and thus forms a zigzag curve as shown in the diagram. The per-student direct expenditure shows a continuous decrease from Rs. 55.36 in 1950-51 to Rs. 42.69 in 1964-65. This means that direct expenditure also does not keep pace wih the increase in the enrolment resulting in a decrease in per capita expenditure.

The total amount spent in different years was met through various sources. As shown in Table 2, the largest expenditure was met through fees. While the role of government had not only remained static but less in proportionate share, the other agencies like Municipal Boards, District Boards, etc., (grouped in the table as Local Bodies fund) were coming forward to meet the real burden. Contributions from other sources which include endowments also were significant.

TABLE 2

Expenditure on Preprimary Schools, by Sources

(Rupees in thousands)

Year	*Government funds*	*Local bodies funds*	*Fees*	*Other sources*	*Total*
1	2	3	4	5	6
1950-51	311 (26.0)	67 (5.6)	541 (45.1)	280 (23.3)	1198 (100.0)
1955-56	641 (25.7)	78 (3.1)	1187 (47.5)	592 (23.7)	2499 (100.0)
1960-61	1574 (26.8)	530 (9.0)	2184 (37.2)	1585 (27.0)	5873 (100.0)
1963-64	2422 (26.3)	1085 (11.8)	3175 (34.5)	2528 (27.4)	8210 (100.0)

Note : Figures in the parentheses indicate the percentage distribution of expenditure by sources.

Sources : Selected Educational and Related Statistics at a Glance (Mimeo.), Education Division, Planning Commission, Government of India, June 1969.

It could be seen from the table that out of the total expenditure incurred in 1950-51, 45 per cent was met through fees, 26 per cent from government funds, 23 per cent from other sources and 6 per cent from local bodies fund. In 1963-64, government's share remained static but the local bodies fund increased to the tune of 50 per cent. The increase in other sources including endowments was also 18 per cent. The share from fees decreased to about 22 per cent. From the above analysis, it is heartening to note that the expenditure met through fees is decreasing and at the same time the funds of local bodies and other sources are increasing. This shows that local participation has been stimulated. However, preschool education still continues to be a costly affair, depriving many needy children from this facility This could be made available to a significant extent, if the funds from the government which have so far taken static position may show an increasing trend.

The average annual cost per pupil during 1950-51, as shown in Table 3 was Rs. 55. Out of this, Rs. 37 were due to teacher costs and Rs. 19 due to non-teacher costs. The average annual salary, which is an important unit of the teacher costs, was Rs. 914. In 1965-66, teachers' salary increased to Rs. 1,000 but per-pupil teacher-cost decreased to Rs. 35.00. This is because of the fact that the number of pupils per teacher in 1950-51 was 25, which increased to 31 during 1965-66. In other words, increase in teacher-pupil ratio was 24 per cent but increase in the salary was only 9.4 per cent. Though teacher cost showed a little decrease and non-teacher cost an increase, there was no marked difference in the overall average annual cost per pupil during the periods under study.

Out of the total expenditure on education, the percentage share of primary education has varied from 0.1 per cent (1950-51) to 0.2 per cent (1965-66). It would not be out of place to mention that for the very basis of human personality development, resources have not been allocated at even 0.5 per cent of the total education budget. Though we know that education as a whole receives a very limited budget, the preprimary stage is further neglected by showing the importance of other stages of education. The Education Commission (1964-66) in its recommendations says: "While we recognize the need to develop preprimary education as extensively as possible, our advance in this sector will necessarily be restricted on account of the inadequacy of the resources available, and especially because primary education must be accorded a higher priority."[16]

TABLE 3

Average Annual Cost Per Pupil

S. No.	*Item*	*1950-51*	*1965-66*
1.	Average annual salary per teacher (Rs.)	914	1,000
2.	Percentage of non-teacher costs to teacher costs	51.3	56.3
3.	Average annual cost per pupil (Rs.)		
	(*a*) Due to teacher costs	37	35
	(*b*) Due to non-teacher costs	19	20
	(*c*) Total	55*	55

*Total does not tally due to rounding off.

Sources : Education Commission (1964-66), Ministry of Education, Government of India.

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[16] *Report of the Education Commission,* (1964-66), *op. cit.,* p. 149.

Such a recommendation needs further probe on the very basis that one stage of education should not be developed at the cost of the other. It is strange that "Many educational planners in the country are convinced of the need and significance of preprimary education. Nevertheless, when it comes to the provision of finances, they are baffled with the problems of finding sufficient resources.....Just as we meet the expenditure of primary and secondary education, we will have to attempt to find resources for preprimary education too."[17] Further, it does not seem to be very apt for the Education Commission to point out that as we are interested in primary education the advancement in preprimary education will have to be restricted. Contrary to this view, the *Forty-sixth Year-Book of the National Society for the Study of Education* has suggested: "The elementary school should build upon the preschool, the high school upon the elementary school, the college upon the high school....The continuity of the

TABLE 4

Projected Growth in Preprimary Education

S. No.	*Item*	*1975-76*	*1985-86*	*% Increase or decrease*
1.	Total Direct Expenditure (in Rs. 000's)	236,956	488.531	106.16
2.	Percentage of total expenditure on education	1.5	1.2	—
3.	Average annual salary per teacher (Rs.)	1,800	2,500	38.88
4.	Number of pupils per teacher	40	40	—
5.	Percentages of non-teacher costs to teacher costs (Rs.)	50.0	50.0	—
6.	Average annual cost per pupil (Rs.)			
	(*a*) Due to teacher cost	50	69	38.00
	(*b*) Due to non-teacher cost	25	34	36.00
	(c) Overall	74	103	39.18
7.	Percentage of the children in corresponding age-group	19.5	21.3	—

Source: Based on the Education Commission (1964-66) estimates.

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[17] R. Muralidharan, Preprimary Teacher Education. In *Education of Teachers in India* (Vol. I),S.N. Mukherji (Ed.), S. Chand & Co., Delhi, 1968, p. 305.

individual and the changing pattern of society, alike, call for an education that starts with young children and continues through adult life.'"[18]

Even if we are interested in primary education the wastage in this sector which is enormous can be reduced by giving preprimary education. *The Indian Year Book of Education, 1964,* has stated: "By far the most important for the poor attainment in Class I is irregularity of attendance. When a child is newly enrolled in school, he is first unwilling to attend...child takes about 6-8 months for what is called being accustomed to attend school." Such a training is possible by giving preschool education to every child. Thus, we feel, regardless of the importance to primary education given in our Constitution, adequate resources should be given to preprimary education.

Estimated Growth in Expenditure

The growth of expenditure in preprimary education on the basis of the assumptions[19] made by the Education Commission (1964-66) is given in Table 4. As is clear from the table, it is expected that by 1975-76 about 19.5 per cent of the children of the nursery school-going age-group would be in the schools and this percentage would increase to 21.3 after ten years. This means that by 1985-86, more than three-fourths of the children of nusery-school age will not be getting education as per current estimates.

The total expenditure is expected to rise in thousands from Rs. 11,000 in 1965-66 to Rs. 236,956 in 1975-76 and Rs. 488,531 in 1985-86. The percentage increase between the period 1975-76 to 1985-86 works out to be 106.16. The average annual salary would increase from Rs. 1,000 to Rs. 1,800 and Rs. 2,500 in the respective reference years, giving the percentage increase of 38.88 in the last decade. The teacher-pupil ratio is expected to rise from 31 in 1965-66 to 40 in 1975-76 and remain static in 1985-86. A significant growth from Rs. 74 in 1975-76 to Rs. 103 in 1985-86 is estimated in the cost per pupil. This has increased from Rs. 55 in 1965-66. The estimated increase of 39.18 per cent in the overall per pupil cost between the period 1975-76 and 1985-86 is "because of the need to provide meals and other health services" to preschool students.

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[18] J.E. Anderson, The Theory of Early Childhood Education. In *The Forty-sixth Year Book of the National Society for the Study of Education, Pt. II,*
[19] See specially Chapter XIX of the *Education Commission Report, op. cit., Early Child Education, op. cit.,* p. 96.

If a critical view of the estimated figures given in Table 4 is taken, it would be right to conclude that the progress will not be satisfactory during the period. As pointed out earlier, by 1985-86 even one-fourth of children in the corresponding age-group will not be in the schools. This shows the need for greater efforts so that an appreciable percentage may find a place in the preschools.

This could be done by increasing the total direct expenditure and reducing the average cost from Rs. 103 per student by devising less costly methods. The experiment of Madras State in which local women run the preprimary schools on a small honorarium is worth a mention in this context. Another important experiment is to establish "children's play centres in close association with the primary schools." These centres are run by specially trained teachers of primary schools and they help in "reducing wastage and stagnation particularly in Class I." The teacher receives an allowance and chalks out a programme of about two hours per day which consists of group singing, story telling, games and personal hygiene and health.

It is a recognised fact "...that fees constitute the major source of financing preprimary education" and "that it is still the privilege of the wealthier section of the society...."[20] Such a thing should not continue in a democratic country like India. Preschool education should be, as far as possible, within the reach of every child. This would be possible only when we are be able to develop an efficient system of financing preprimary education where "State should assist through grants-in-aid on a basis of equalisation."

It is further suggested that all the agencies like Central Social Welfare Board, Social Welfare Department, Block Development Office and Gram Panchayats or Municipal Boards giving money to preprimary education should pool their resources at one place and develop, a mutually agreed policy of grants-in-aid.

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[20] S. Kumar, Preprimary Education. In *Development of Education in India, 1947-66*, Uday Shanker and S.P. Ahluwalia (Eds.), Department of Education, Kurukshetra University, Kurukshetra, 1967, p. 4.

The present author differs further with the recommendations of the Education Commission and believes that the government should play a more active role in financing preprimary education. The reason for such thinking is that in India the importance of preprimary education has so far not been recognised in general, and in particular by all parents. Preschool education should be treated as a part of the infrastructure; the superstructure of the educational pyramid will be as strong as the basic foundation. In such a situation the role of the government as an active participant is more desirable. It does not mean that we discourage private funds for preprimary education. They are most welcome in the forms of endowments and donations. However, the point of emphasis is that the government should take direct responsibility and bear the cost for providing such an education. In support of this argument, it is proper to quote the observations of the *Forty-sixth Year Book of Education, referred to earlier*, "The reasons for publicly financed nursery schools have been clearly articulated. The beginnings are now in order. Again, the promise of growth in this need is tied up with the future economic affairs of our nation. Would that all parents, educators and citizens always kept clearly in mind this relationship of the needs of children with our national economic outlook."

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Predictive Efficiency of Marks in Classes VIII, IX, X, in Forecasting Higher Secondary Examination Marks

Arun Kumar Gupta

In this study the author has attempted to predict the total marks and divisions of 26 boys and girls in the higher secondary examination on the basis of the marks obtained by the candidates in their annual school examination in Classes VIII, IX and X. A multiple regression equation involving four variables was used. The results revealed that the Class VIII, IX and X marks can provide a satisfactory prediction of total marks in the final higher secondary examination and are reliable and valid measures of academic achievement.

Predicting academic success is a ticklish affair since the variable to be predicted, namely, academic achievement, is dependent upon a host of factors—both intellectual and non-intellectual, acting directly or indirectly—the control of all of which is difficult, if not impossible. This is more so at the school stage where the child not only grows academically but also physically, mentally, emotionally and socially

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at the same time. Coupled with these general handicaps in accurate predictions is the lack of standardized measures of academic achievement (in India at least!) so that one is forced to fall back upon the traditional examination results which are already notorious for their unreliability and lack of validity. Yet, the importance of such studies need not be underestimated in our educational setting where systematic guidance, both educational and vocational, is conspicuous by its absence and so is aptitude testing. Teachers and students, therefore, have no alternative but to adopt trial-and-error methods in matters of admissions, allotment of subjects and streams. Consequently, huge personal and social losses occur when square pegs break themselves in adjusting to round holes! Of late, however, studies in academic prediction have been taken in hand although their number is very meagre (NCERT, 1969). Mention may be made of a few such investigations carried out by Dutt (1956), Sharma, (1958), Sharma (1961), Basu (1966), Bhatnagar (1968), Passi and Kour (1968), Sharma and Garg (1971) and Passi and Behl (1971).

A general criticism against such investigations is that while they have as their frame of reference none others but the research personnel themselves, parents, teachers, school authorities and students, for whom such predictions are all the more important, are kept away from the picture. The present investigation is an attempt to predict total marks and divisions in the Board's Higher Secondary Elective Examination by students on the basis of their aggregate marks in their annual examinations in Classes VIII, IX and X. So far, few attempts have been made in this direction although this aspect, i.e., prediction of the aggregate marks and divsions holds maximum suspense, curiosity and interest for students, parents, teachers and school authorities. The evidence of this may be found in questions like "How many marks shall I get?" or "Which division is he likely to secure?", which are frequently asked and irresponsibly answered in our schools. Besides this, the present investigation is novel in the sense that not only longitudinal records of academic achievement scattered over years regarding the pupils have been utilized—something which is difficult to obtain in our schools—but in that an attempt has been made to know the predictive validity of marks in a particular school which form the basis of subsequent admissions in higher classes.

RESEARCH DESIGN

Sample

266 boys and girls who had passed their higher secondary elective examination conducted by the J. & K. Board of Higher Secondary Education from the Model Institute of Education and Research, Jammu, from 1964-65 (the year when the first higher secondary elective examination was conducted by the Board) to 1969-70 formed the initial sample for the study. Out of these, as many as 110 (76 boys and 34 girls) were isolated for the present investigation on the grounds that they had been regular students of the Institute since passing their Class VII examination (i.e., from 1960 onwards). Their aggregate marks in Classes VIII, IX and X (annual examination) were utilized to fit in a regression equation on the basis of which total marks and divisions of 26 boys and girls (who had appeared in the Higher Secondary Elective Examination, March 1971) were predicted. Thus, in all, 136 pupils were involved in the present study. The Institute from which sample was selected is a prominent co-educational institute in the State since 1936 and is well known for the quality of education and excellent Board results.

Procedure

Collection of data. Besides the identification data of each pupil, his aggregate achievement scores in Class VIII, IX, X and XI annual examinations were recorded as contained in the school records. This task involved shifting through school results of different classes of more than a decade and was very time-consuming. The different scores of each pupil were entered in a table against his name. Arithmetic computations were made wherever necessary to ensure that all the scores in one class, though distributed throughout years, were within the same range.

Treatment of data. Four distributions of achievement scores, one for each class, were obtained and their means and S.D.s were worked out. Pearson's Product Moment Correlations between any two distributions taken at a time were next computed by scattergram technique and in this way six values of r were obtained. Since the present prediction design involved four variables, namely, marks in Class VIII, IX, X and XI annual examinations, it was decided to fit in a linear regression equation by utilizing partial correlations as outlined by Walker and Lev (1965) and Garret (1967). Partial correlations were, therefore, computed as necessitated by the model. Similarly partial *Os* were also worked out. These values were in turn employed to find b coefficients. Standard error of estimate and the coefficient of multiple correlation (R) were also computed. Necessary correction for inflation of R was also made by applying the shrinkage formula.

By utilizing the regression equation, the total scores of 26 boys and girls, who had appeared in the higher secondary elective examination in March 1971, were predicted. These were compared to their actual scores (declared in June 1971) and discrepancies, if any, were worked out. An attempt was made to explain these.

RESULTS AND DISCUSSION

Table 1 shows the values of Mean and S.D. computed for the four distributions of achievement scores [viz., Class XI (X_1), Class X (X_2), Class IX (X_3) and Class VIII (X_4)] along with the value of the correlation coefficients obtained between any two distributions at a time, arranged in terms of a correlation matrix. Out of six product moment correlations worked out, as many as four are significant at .01 level while two values are insignificant. Since the suggested regression equation utilizes the total marks obtained in Classes X, IX and VIII respectively as predictors for Class XI, all the correlation values involved therein are significant at .01 level. This, in turn, indicates that positive and significant correlation exists between the marks obtained by pupils in the school in Classes VIII, IX and X and their marks at the Class XI level and that prediction of the latter is possible on the basis of the former. This also reflects the reliability and validity of the school marks and, contrary to various studies [e.g., Sharma and Garg (1971), Basu (1966)], school marks have been found to correlate well with the total marks at the Class XI level. Besides this, the correlation between Class VIII and IX marks is also significant at

.01 level which indicates the reliability of the school examination marks at these levels.

TABLE 1

Means, S.Ds., and Correlation Matrix Obtained from Four Different Distributions of Achievement Scores

Distribution	*Mean*	*S.D.*	*Product Moment Correlation*			
			1	*2*	*3*	*4*
No. 1 X_1 (Scores in Class XI)	M_1 = 438.14	77.382	1.00	.470*	.473*	.362*
No. 2 X_2 (Scores in Class X)	M_2 = 403.64	59.734		1.00	.160	.159
No. 3 X_3 (Scores in Class IX)	M_3 = 292.82	81.223			1.00	.361*
No. 4 X_4 (Scores in Class VIII)	M_4 = 259.01	68.433				1.0

*—r Significant at .01 level

Table 2 represents the values of different partial correlations (both of first and second order) together with the values of partial sigmas which were employed to calculate the values of partial regression coefficient to be inserted in the regression equation. The value of coefficient of multiple correlation *R* is .9723, which is near perfect and reflects the accuracy of predictions. In other words, if correlation is worked out between the available achievement scores in Class XI and such scores predicted from the present regression equation, the value of the correlation would be .9723 or near perfect. The value of *R* after applying the necessary shrinkage formula for inflation is .9715 which confirms the above observations. All this speaks very highly of the reliability of the regression equation and con-

TABLE 2

The Value of Partial Correlations of First Order, Partial Correlation of Second Order, Partial Sigmas, Partial Regression Coefficients, Coefficient of Multiple Correlation, R (Actual and Corrected), Standard Error of Estimate and the Final Regression Equation

First Order Partial Correlations		*Second Order Partial Correlations*		*Partial Sigmas*		*Partial Regression Coeff. (b)*		*Coeff. of Multiple Correlation*		*Standard Error of Estimate*
Partial Correlation	*Value*	*Partial Correlation*	*Value*	*Partial σ*	*Value*	*b*	*Value*	*Actual R*	*Corrected R*	
12.3	.4545	12.34	.4437	1.234	18.0996	12.34	.4836	.9723	.9715	18.0996
13.2	.4569	13.24	.4463	2.341	16.6062	13.24	.3792			
14.2	.3291			3.124	21.3049					
14.3	.2324	14.23	.3348	4.123	16.5538	14.23	.3661			
24.3	.1098									

Regression Equation $(X_1 = .4836\,(X_2 - 403.64) + .3792\,(X_3 - 292.82) + .3661\,(X_4 - 259.01) + 438.14$ (Raw score form)

where X_1 = Predicted total raw score of student in Class XI examination

X_2 = Total raw score of student in Class X annual examination

X_3 = Total raw score of student in Class IX annual examination

X_4 = Total raw score of student in Class VIII annual examination.

firms that the marks obtained by the pupils in Class VIII, IX and X annual examinations can be fruitfully employed to predict success in Class XI examination. The value of standard error of estimate $(\sigma_{est}\ X_1) = 18$, which is also depicted in Table 2, conveys that in two out of three cases, the predicted marks shall not miss the actual marks by a difference of more than 18 marks (± 18). Finally, Table 2 shows the final form of the regression equation wherefrom the scores of 26 students, who had appeared in the Higher Secondary Elective Examination in March 1971 were predicted on the basis of their marks in Classes X, IX and VIII annual examinations.

Table 3 represents the total marks and divisions predicted for 26 boys and girls in the Higher Secondary Elective Examination along with their actual marks and divisions and the computation of discrepancies therefrom, if any. A cursory glance indicates that the predictions of marks has come out true in a number of cases. Thus, out of 26 students, in as many as nine or 35 per cent cases, the prediction of marks has been dead accurate. This shows that prediction of academic success at Class XI level can be made with certainty when the scientific procedure is followed and when marks of the pupils in their last three classes in same school are taken into consideration. It is, however, clear from the table that in five cases (19 per cent) the discrepancy between the predicted and the actual marks is very meagre and does not exceed twice the value of standard error of estimate. In terms of percentage of marks, this discrepancy comes out to be a little more than 4 per cent of the predicted range and is small enough to be neglected. Taking this into consideration, in as many as 53 per cent students, the present study was able to predict total marks accurately. If, however, one relaxes the limit to a discrepancy of three standard errors of estimate, four more cases can be included for whom academic success has been predicted accurately though the range of discrepancy in the said class is larger.

To sum up, it is possible to predict the Class XI marks more or less accurately in 68 per cent cases, which is very remarkable by any standards of prediction. All this indicates that if longitudinal achievement records of pupils in the same institution are utilized for scientific prediction, there is a likelihood of success in the effort—something which should be taken notice of by school authorities. Further, the effectiveness of school marks to predict accurately is a sure indication of their predictive validity.

TABLE 3

Discrepancies between Predicted and Actual Achievement in Terms of (i) Total Marks and (ii) Division Obtained

No. of the Student	$X_1 \pm 18$ PREDICTED P	*Total Marks in Class XI*		*Division*		
		ACTUAL A	DISCREPANCY P-A	PREDICTED	ACTUAL	DISCREPANCY
1	654	520	-116	I	I	
2	632	574	-40	I	I	
3	584	550	-16^{x}	I	I	
4	416	508	$+74$	II	I	(x)
5	594	558	-18^{x}	I	I	
6	548	547	—	I	I	
7	502	528	$+8^{x}$	I	II	
8	580	419	-143	I	I	(x)
9	481	382	-81	II	II	
10	442	524	$+64$	II	I	(x)
11	440	409	-13^{x}	II	II	
12	403	388	—	II	II	
13	421	439	—	II	II	
14	480	436	-26^{xx}	II	II	
15	502	524	$+4^{x}$	I	I	
16	490	385	-87	II	II	
17	360	419	$+41^{xx}$	II	II	
18	347	300	-29^{xx}	II	II	
19	292	340	$+30^{xx}$	II	II	
20	357	350	—	II	II	
21	409	491	$+64$	II	I	(x)
22	456	462	—	II	II	
23	510	526	—	I	I	
24	392	410	—	II	II	
25	407	422	—	II	II	
26	459	477	—	I	I	

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x—discrepancy within 2 ($\sigma_{est} X_1$)
xx—discrepancy within 3 ($\sigma_{est} X_1$)
(x)—discrepancy between predicted and actual division.

Although there are considerable similarities in the predicted and actual scores, there are a few glaring discrepancies also. For example, in case of Students Nos. 1, 4, 8, 10, and 16, to mention a few, large inconsistencies may be found in the actual and the predicted scores. Reasons for such discrepancies can, however, be given. Students Nos. 10, 17, 19, and 21, for example, had switched over to arts since their academic progress was being arrested by the presence of mathematics and general science in Classes VIII, IX and X—a fact which was verified from school records. These students in fact overachieved since their achievement at Class XI level had been predicted from their past achievement which was affected, to a large extent, by low marks in science, and mathematics. Students Nos. 2, 3, and 5, to take another example, underachieved since they had opted for medical subjects whereas, in their previous classes, they had scored very high in mathematics. But, perhaps, the most interesting case is that of Students Nos. 1, 8 and 16, who have severely underachieved. In the beginning and end of the session, the author had, for another study, drawn sociograms for the said class and these three students (all female) had formed a triangle on both the occasions, thus indicating an exclusive and closely knit gang! They were, according to teachers, non-serious and very mischievous with less taste for science and mathematics, which they had taken. No wonder then, that they fouled all the predictions based on their previous high academic achievements. Student No. 1, however, was the worst sufferer since she had secured the first position in her Class X examination.

The above analysis highlights the importance of predicting separately for the different streams which was not, however, attempted in the present investigation.

Coming to divisions, one finds that in only four out of 26 cases has the prediction gone awry. In other words, in 22 out of 26 cases (85 per cent dead accurate prediction was made which speaks high of the reliability and validity of the school marks for predicting divisions at the Class XI level. In four cases, where discrepancies occur, there are no glaring inconsistencies in the sense that there is no case where a third or a first division may have been predicted while a first or third division may have been actually obtained. Therefore, it might be concluded that in the present investigation, in nearly 85 out of 100 cases, it has been possible to predict very accurately the divsion of the prospective examinee in the Higher Secondary Elective Examination. If not for the prediction of marks, annual school examination marks in Classes VIII, IX and X may, with profit, be utilized for predicting divisions in Class XI examination.

CONCLUSIONS

In the light of the foregoing analysis, the following conclusions may be drawn.

1. The annual examination marks in Classes VIII, IX and X obtained by the pupils in the particular school are adequate predictors of success at the Class XI level. The marks obtained in Class X correlated most with the criteria to be predicted, followed by marks obtained in Classes IX and VIII respectively. In fact, correlations were found to fall off gradually with each successive year.

2. The school marks have been found to be reliable and valid measures for the purpose of individual discrimination in the group and they can be utilized to fit in a linear regression equation for better prediction. Such an equation, when based on a pupil's longitudinal achievement scores of the previous years, in the same institution, tends to yield a fairly representative indication of his future achievement.

3. Although the prediction in 68 per cent of the total cases was accurate, or accurate within reasonably tolerable limits, it might be better to take into consideration the change of subjects, if any, the pupil's hard work and motivation for higher achievement, along with classroom behaviour during the session if prediction of total marks has to be attempted. In fact, the above factors may also form subsequent dimensions, due weightage to which should be given in any regression equation fitted for the purpose. In the absence of such data, the regression equation is likely to yield at best an approximate estimate of a pupil's future achievement which teachers, parents and school authorities must utilize to devise adequate educational programmes resulting in higher achievement.

4. The regression equation worked out in the present investigation was shown to predict divisions of prospective Class XI examinees

fairly accurately in 85 per cent cases on the basis of past school examination records. As such, it might be most worthwhile if prediction of divisions is made rather than arriving at a rough estimate of one's total marks, because of the greater reliability of the former.

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A Comparative Study of Rural Boys and Girls Enrolled at Primary Stage with Reference to Some Variables

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According to the Second All India Educational Survey conducted by NCERT in 1966, facilities for primary education have been provided in India on an almost universal basis but the enrolment is much below what it should be. Further, the survey reveals that there exist variations in the enrolment from State to State, and between boys and girls. In this study the author has attempted to determine the extent to which variations in enrolment indices are explained by certain selected factors, such as density of population, literacy index, etc. He has also attempted to determine the contribution of each factor towards the criterion variance and to get a comparative picture of these factors in regard to boys and girls separately.

Article 45 of the Indian Constitution has laid down that "The State shall endeavour to provide within a period of ten years from the commencement of the Constitution, free and compulsory education for all children until they complete the age of 14 years." This directive in the Constitution could be fulfilled by providing universal educational facilities up to middle stage, bringing all children of the age up to 14 years to school and retaining them in school till they complete the stage of such education.

In an effort to fulfil this constitutional directive, there has been tremendous expansion of educational facilities during post-Independence period. In the year 1957, the First All India Educational Survey[1] was conducted to assess the achievement of provision of educational facilities during these years. The survey reported that about 83 per cent population was served by primary sections located either in the habitations or within a walking distance of one mile. The survey also pointed out that about 50 per cent habitations are served by middle sections located in the habitations or within a walking distance of three miles. Keeping in view the achievement at that time and the magnitude of the task before the country to fulfil the constitutional directive, the following objectives were laid down in the Third Five Year Plan:

> In view of the magnitude of the task, it was agreed early in the Second Plan that as a first step facilities should be created for education of all children in the age group 6-11. This is one of the central aims of the Third Plan to be followed by extension of education to the entire age group 11-14 during the Fourth and Fifth Plans.[2]

How far have these objectives envisaged in the Third Plan been achieved ? Keeping these objectives in view, NCERT conducted the Second All India Educational Survey in 1966. According to the Survey, 94.96% of the rural population had been provided with primary education facilities. The remaining population (5.04 per cent) belonged to small habitations. The survey revealed that 87.23 per cent of the rural habitations not served by primary schools or schools having primary classes had populations 'below 300' each. This included 45.37 per cent habitations with population 'below 100' each. At this point, the survey observed that in future the expansion of primary education facilities will mainly consist of providing schools for small habitation.[3]

The survey further reported that enrolment at primary stage taken as percentage of the estimated population in the age-group 6+ to 10+ years was 74.36.[4] This percentage is slightly higher than the actual because in the survey enrolment was taken on the basis of all children studying in the primary classes. This figure included also those children whose age was outside the specified age-group (6+ to 10+ years).

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[1] *Report of the All India Educational Survey*, Publication No. 462, Ministry of Education.

[2] Third Five Year Plan, Planning Commission, *Govt. of India*, p. 578.

[3] *Second All-India Educational Surveys: Summary of Findings*, NCERT, p. 94.

[4] *Ibid.*, p. 95.

According to the survey, facilities for primary education have been provided almost on universal basis but the enrolment is much below what it should be. Further, the survey reveals that there exist variations in the enrolment from State to State and between boys and girls. A break-up of the enrolment percentage indicates that girls' enrolment (54.70 per cent) is far below that of boys (93.30 per cent). The State-wise percentage of boys' enrolment varies from 70.55 to 139.86 and of girls from 23.09 to 111.41. This indicates a wide gap between the enrolment of boys and girls, in the States as well as in the Union Territories. In Kerala, both the percentages are highest in the country and the gap between the two is the least. The survey also reveals that there is no discernible concomitance of variation between the enrolment percentages (both boys and girls) between States. The same feature is noticed as between the various districts within a State. In view of the low enrolment and of the variations outlined above, it becomes necessary to study the various factors that influence enrolment of both boys and girls at primary stage. It was with this purpose that this study was conducted.

Objectives

The following were the objectives of the study:

1. To determine the extent to which the variations in enrolment indices are explained by certain selected factors, such as density of population, literacy index, etc.
2. To determine the contribution of each factor towards the criterion variance.
3. To get a comparative picture of the contribution of these factors to the enrolment indices of boys and girls separately.

Scope

To realise the objectives stated above, an attempt has first been made to identify the factors associated with the enrolment in various districts and to ascertain as to what extent these factors explain the variations in the enrolment.

For this study, the indices and definitions of various factors used in the Second All India Educational Survey and Census of India have been adopted. The criterion variable for this study, the enrolment index, is "the number of children enrolled at primary stage per 10,000 population of the district."[8]

The factors considered in this study may broadly be classified under three heads: educational, economic and sociological. It may be stated here that all possible factors under these heads have not been included in this study. Some of these factors are: per capita income, rate of economic growth, extent of industrialization, etc. Such factors could not be taken into account because there were some technical difficulties in their estimation at district level. Some other factors like development of education in the district, cultural background of the district and social traditions of inhabitants such as the *purdah* system, child marriage, etc., posed the problem of quantification. In view of the above limitations, following twelve factors have been taken into consideration for this study:

1. *Index of primary education facilities* (*IPEF*). This is given by the percentage of rural population in the district which has educational facilities for primary stage in its own habitation or within a walking distance of one mile.

2. *Average size of rural habitations.* This is the ratio of the total rural population in a district to the number of rural habitations.

3. *Availability of teachers.* This is the number of teachers working per ten thousand of the population in a district.

4. *Availability of professionally qualified teachers.* This is the percentage of trained teachers working at the primary stage in a district.

5. *Availability of academically qualified teachers.* This is given by the percentage of at least matriculate teachers working at the primary stage in a district.

6. *Availability of qualified teachers.* This is the percentage of at least matriculate and trained teachers working at the primary stage.

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[8] *Ibid.*, Chapter VI, p. 31.

7. *Literacy index.* This is given by the number of persons, literate and educated, per thousand of the population.

8. *Density of population.* This is the population of a district per square mile.

9. *Extent of urbanisation.* This is measured by the proportion of urban population in a district.

10. *Population of backward classes.* This is given by the percentage of backward classes, including scheduled castes and scheduled tribes.

11. *Non-agricultural workers.* This is the percentage of non-agricultural workers in a district.

12. *Per capita expenditure on primary schools.* This is the ratio of the total expenditure on primary schools to the total population of a district.

Source of Data

The district-wise information on criterion variable and the factors included in this paper was available from various sources. The latest information on some of these factors and criterion variable was available from the Second All India Educational Survey conducted in the year 1966. The latest information pertaining to literacy, density of population, etc., was available for the year 1961. Therefore, projections have had to be worked out in case of those factors containing information for the year 1961.

Information on criterion variable and Factors 1-6 above was available for 31 December 1965 in the State tables of the Second All India Educational Survey.

Information pertaining to the remaining factors mentioned above was available for the year 1961. For projection of Factors 7-11, the basic data was taken from Census of India (paper No. 2, 1962). For Factor 12, per capita expenditure on primary schools, the basic data was taken from the monograph *Cost of Education in India* (NCERT).

The State of Jammu & Kashmir and the Union Territories have not been included in the study because district-wise information on certain factors was not available.

Analysis

Keeping the objectives of the study in view, multiple regression analysis was carried out. The multiple correlation coefficients in case of boys and girls were calculated to know the extent to which variations in enrolment indices are explained by the above factors in each case. Regression coefficients were also calculated and tested for their significance.

Values of multiple correlation coefficients computed for the enrolment indices of boys and girls come out to be 0.631 and 0.814, respectively. These coefficients are significant at 5 per cent level of significance which gives sufficient evidence that regression equations adopted for prediction of enrolment indices do serve the purpose.

The percentage of variation in enrolment indices explained by the factors in case of boys and girls is 39.75 and 66.34, respectively. Differences in the above precentages lead to the conclusion that the contribution of these is comparatively much higher for girls as compared to boys. More than 60 per cent of variation in case of boys remains unexplained by these factors. In spite of a comparatively low percentage in case of boys, it will be of interest to look into contributions of individual factors given in the table.

Out of the twelve factors included in this study, there are four common factors which make a significant contribution to the variations in boys' and girls' enrolment indices, while there are two factors which are applicable to boys only and another two factors influencing the girls' enrolment significantly.

The common factors are: availability of teachers, density of population, literacy index and population of backward classes. In case of boys' enrolment, the maximum positive contribution is from availability of teachers, while literacy index occupies the next place. In case of girls, maximum positive contribution comes from literacy index while availability of teachers comes next. The remaining two common factors make a significant but negative contribution to enrolment indices in case of boys and girls, which indicates that high density of population does not necessarily mean that proportionately more children will be attracted to schools and also that social and economic deprivation is not conducive to enrolment in schools.

TABLE

Regression Coefficients and Their Standard Error for Enrolment Indices of Boys and Girls

FACTORS	BOYS			GIRLS		
	Regression coefficient	*Standard error*	*Critical ratio*	*Regression coefficient*	*Standard error*	*Critical ratio*
1. Average size of rural habitations	—0.026	0.0155	1.68	0.014	0.017	0.85
2. Index of primary education facility	—0.117	0.133	0.88	—0.368	0.139	2.78*
3. Availability of teachers	8.662	1.027	8.43*	6.616	1.076	6.15*
4. Trained teachers	0.262	0.183	1.43	—0.280	0.191	1.47
5. Academically qualified teachers	0.507	0.360	1.43	—0.044	0.376	0.12
6. Qualified teachers	0.339	0.381	0.89	—0.857	0.399	2.15*
7. Density of population	—0.002	0.001	2.11*	—0.003	0.001	2.28*
8. Literacy index	0.056	0.083	6.83*	1.158	0.087	13.38*
9. Extent of urbanization	—0.009	0.049	1.84	—0.109	0.060	1.80
10. Population of backward classes	—1.303	0.33	3.84*	—1.085	0.350	3.10*
11. Per capita expenditure on primary schools	—34.277	7.572	4.52*	4.064	7.931	0.51
12. Non-agricultural workers	—1.466	0.375	3.92*	—0.421	0.392	1.07

*Significant at 5% level

The other two factors making a significant but negative contribution to boys' enrolment indices only are: per capita expenditure on primary schools and percentage of non-agricultural workers. In so far as the per capita expenditure is concerned, this negative contribution could be due to a variety of factors of which the existence of a large number of such institutions which are not economically viable may be an important one. The percentage of non-agricultural workers making a negative contribution to enrolment indices probably reflects a lack of willingness among them to send their wards to schools for various reasons, identification of which is beyond the scope of this study.

Availability of primary education facilities and qualified teachers does not seem to attract enough girls to school. Obviouslyy, this is counterbalanced by various social inhibitions attached to girls' education in rural areas which can, but do not, send their girls to school.

Conclusion

The analysis in the preceding paragraphs has brought to light several factors which have a bearing on the enrolment indices of boys and girls. This could provide a direction for taking up action programmes at district level to bridge the gap between the enrolment and the educational facilities provided. These programmes could include incentives to weaker sections of the community to send their children to schools, especially in case of girls where some special programmes are suggested by the National Council for Women's Education in their *Sixth Annual Report* (Publication No. 782, Ministry of Education, pp. 5-8).

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A Perspective View of Teaching and Learning

M. Raghuram Singh

The author briefly reviews various theories of teaching, teaching models, instructional procedures and techniques, and classroom interaction, and presents an overall view of teaching and learning.

Teaching has been with us for a long time and yet we have not developed a generally acceptable single conception of teaching. We need to develop a unique conception of teaching for organising our present knowledge on teaching and to propose research that will guide our teaching practice.

Theory of Teaching

We have some theories of teaching. An ideal theory of teaching should tell us as to: (a) How teachers behave? (b) Why they behave, as they do. (c) What are the effects of their teaching behaviour? The teaching theories that are now available do not meet our requirements of a good theory fully. The best substitute for a teaching theory is a teaching model. A teaching model mostly suggests how various teaching and learning conditions are interrelated. In many fields, models are prototypes of theories because they make possible early conceptualisation and study of phenomena. Unlike theories, in the initial stage of development models lack factual support. Ultimately effective models give way to empirically supported theories.

Teaching Models

Dececco (1970) considers various teaching models:

1. Computer-based teaching model developed by Lawrence Stolurow and Daniel Davis.
2. Psychological model of teaching developed by John Carroll.
3. Psychological model of Ned Flanders called Social-interaction Model.

He also considers three historic models of teaching:

1. The Socratic model.
2. The Jesuit classical-humanist model.
3. The personal development model.

Dececco has developed a Basic Teaching Model modifying the model of Robert Glaser.

A Basic Teaching Model

Dececco's Basic Teaching Model has four major components as shown in Fig. 1.

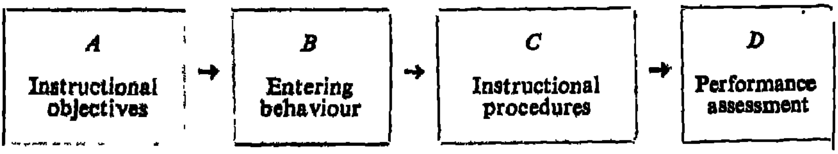

Fig. 1

The connecting arrows show the sequence of operations in the instructional process. A teaching plan commences with defining instructional objectives and measuring entry behaviour of the input, the student. Teaching strategies and instructional procedures are worked out in the educative process. Learning outcomes are measured and this is known as Performance Assessment.

In Fig. 2 the feedback loops connect the performance assessment with the other three components. The information flowing out of assessment is provided back to the other three components by the loops.

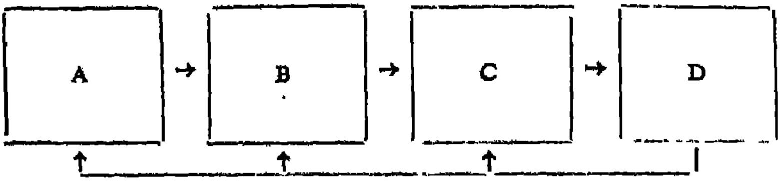

Fig. 2

INSTRUCTIONAL OBJECTIVES

In addition to educational aims and goals, course objectives are important and teachers and students should be aware of general and specific educational objectives that they should attain. Mager (1962) spells out in detail that the objectives must be stated clearly, operationally and in measurable terms. What a student can achieve at the end of a course in terms of behavioural change or operations must be stated. Instruction should be performance-oriented and instructional objectives should state what learning outcomes are expected, under what conditions learning takes place, and what the criterion is for measuring the minimum standard of performance to declare a student eligible at the end of the course.

Taxonomies of Educational Objectives

Educational objectives fall into three domains as classified by Bloom *et al.* (1956). The categories in each domain are arranged as a hierarchy, proceeding from simple to complex:

I *Cognitive Domain*	*II* *Affective Domain*	*III* *Psychomotor Domain*
1. Knowledge	1. Attention	Skills
2. Comprehension	2. Interests	
3. Application	3. Attitudes	
4. Analysis	4. Values	
5. Synthesis	5. Value complex	
6. Evaluation		

Deficiencies in Objectives

Teaching as practised today mostly does not foster the development of abilities of synthesis and evaluation—the critical abilities of a higher order. The teaching-learning process as it goes on in our country does not take conscious note of the development of right values and value complex on the part of course members. The psychomotor domain is still under study for a classification to be attempted.

Entry Behaviour

Instructional staff should know what the student has already learned before he presents himself for further instruction. The description of the entering behaviour is useful for suitably designing the instructional procedures, materials and strategies. By analysing the entering behaviour of the student, the teacher as instructional designer is able to know learning sets, learning abilities and learning styles of the learners. An assessment of entering behaviour makes it possible to fix the terminal behaviour to be expected at the end of a course. An assessment of the output of the system acts as a feedback to the other three components.

INSTRUCTIONAL PROCEDURES

Learner-centred

Instruction should be tailored to the objectives to bring about changes in human capabilities (learning outcomes). It should be a learner-centred approach rather than a teacher-centred one. Instruction should involve the student in the process. It needs to be response-oriented instead of stimulus-oriented. In instruction it should not be assumed that the teacher is the primary source of information. The role of a teacher is to design a course, formulate objectives, measure entering behaviour of students, prepare and offer curricular materials availing of the multimedia approach, guide and evaluate the progress of learning. The teacher should adopt the closed-loop systems approach instead of the erstwhile open-loop approach (Bhat, 1970).

Learning

Teaching is defined as 'causing to learn'. Learning is defined as 'fairly permanent change in behaviour consequent on a sequence of instructional experiences' (Sorenson, 1964). Learning should not be just at the rote-learning level; it should actually attempt to reach the higher cognitive levels. Gagnel has classified learning types into a hierarchy.

Varieties of Learning

8. Problem solving
↑
7. Principle learning
↑
6. Concept learning
↑
5. Multiple discrimination
↑
4. Verbal associates
↑
3. Chain of S-R connections
↑
2. Stimulus Response connections
↑
1. Signal learning

The simplest is signal learning and the arrows show the direction of development of higher types of learning. Due concern should be shown to internal and external learning conditions while designing instructional procedures. Special conditions are required for classical conditioning, operant conditioning, skill learning, verbal learning, concept learning, principle learning and problem solving. The teaching-learning process should be geared to realise the higher order of learning that will also facilitate development of creativity, learning by discovery and transfer of learning.

The Questioning Technique

Teaching should be planned to promote the development of higher order mental abilities. The questioning technique, if handled rightly, can raise learning beyond memory level. Sanders (1966) gives a taxonomy of questions and observes that a teacher who has mastered the taxonomy can use it in a number of ways to improve the intellectual climate of his classroom. This taxonomy of questions is based on Bloom's categories and these categories are sequential and cumulative. Each category of questions calls for certain unique elements in thinking but also includes some form of all the lower categories. The following chart illustrates this idea:

Taxonomy of Questions

						Evaluation
						↑
					Synthesis	Synthesis
					↑	↑
				Analysis	Analysis	Analysis
				↑	↑	↑
			Application	Application	Application	Application
			↑	↑	↑	↑
		Interpretation	Interpretation	Interpretation	Interpretation	Interpretation
		↑	↑	↑	↑	↑
	Translation	Translation	Translation	Translation	Translation	Translation
	↑	↑	↑	↑	↑	↑
Memory	Memory	Memory	Memory	Memory	Memory	Memory

Teachers at all levels of education should find these categories useful and operate every one of them in their classes.

Interactional Model of Instruction

Educationists have been innovative and many strategies and techniques have been developed to make learning a continuing joy. Flanders in his model of interaction in a classroom situation categorises ten classes of verbal behaviour.

Amongst these 10 categories, 5, 6, 7, refer to direct stimuli from the teacher. Categories 1, 2, 3, show indirect influence and 8, 9, and 10 show direct student influence on classroom learning. Use of categories 5, 6, 7, promotes dependence on teacher and affects achievement; achievement refers to the difference between entering behaviour and

Summary of Categories of Interaction Analysis

TEACHER TALK	*Indirect Influence*	1. Accepts feeling of students
		2. Praises or encourages students
		3. Accepts or uses ideas of students
		4. Asks questions
	Direct Influence	5. Lectures
		6. Gives directions
		7. Criticises or justifies authority
STUDENT TALK		8. Student talk—Response
		9. Student talk—Initiation
		10. Silence or confusion

terminal behaviour. If we are to make learners responsible for learning, we have to provide for their increasing participation in classroom behaviour.

Pupils learn not only from a teacher, but learn a lot from among themselves. Peer teaching can be encouraged. Small-group discussions, committee meetings, buzz sessions, brainstorming exercises are many stimulating group methods of learning (Singh, 1969).

Self-Study Technique

Pupils learn not only from teachers and from peers but also learn from private self-study. Autotutorial technique, programmed learning and teaching machines, study cartels and computer-assisted instruction provide for self-study. The advantages of self-study are quite obvious. We can get over difficulties of staff shortages, dearth of building accommodation and individual differences among students by planning to provide for individual study. Self-pacing, response-oriented learning progress, immediate and thorough feedback are to be mentioned as some of the merits of these innovations.

Programmed Instruction

Programmed learning merits special consideration. The Skinnerian concept of reinforcement as incorporated in programmed material gives it a special status. Programmed materials may be designed as special self-contained instructional packages. A programmed text is intended for a specified target population; there is a pre-test that is followed by instructional frames, and at the end of it a post-test. A learner can himself find out the gain index as a result of learning through a programme. Programmed instruction approximates to self-instructional scheme.

Audio-visual Education

The process of education can be revolutionised with the use of software and hardware of instructional technology. With the increasing use of films, filmloops, project technology, cassettes, CCTV and TV and CAI, education has entered the machine age. There can be better learning outcome with a commitment to technologise the teaching-learning process. Summerlie's (1971) experiment has proved that a computer instructed group learn faster than the traditionally taught group.

Individualised Instruction

Mitgel (1970) discusses the concepts of individualisation while describing the method of Individually Prescribed Instruction (IPI):

1. The learner proceeds through content materials at a self-determined pace that is comfortable to him.
2. The learner works at times convenient to him.
3. The learner begins instruction in a given subject at a point appropriate to his past achievement.
4. Lectures are used as vehicles of motivation rather than sources of critical information.
5. Individualisation can be achieved by furnishing the learner with a wealth of instructional media from which he may choose.
6. The unit-perfection requirement for advance lets the student go ahead to new material only after demonstrating mastery of the material which preceded.

Adaptive Education

The impending instruction revolution will soon bypass the simple idea of individualising instruction and move ahead to the more sophisticated notion of providing adaptive education for school and college learners. Adaptive education means the tailoring of subject-matter presentations to fit the special requirements and capabilities of the learner. The ideal is that no learner should stop short of his ultimate achievement in an area of content because of idiosyncrasies in his study strategies. Utilising the knowledge of individual differences, instructional materials are tailored to bring about optimum learning for each student.

Component Teaching Skills

There are definite professional teaching component skills that are to be defined by a body of expert practitioners for each level and subject and such a thing if accomplished will be useful for practising and prospective teachers (Singh, 1971).

The author has identified 25 component teaching skills with regard to classroom teacher behaviour and has prepared a teacher profile on the teacher's assessment of teaching competence by students (1971). This attempt may be extended to cover other areas of teacher operation; a job description of the teacher can be prepared and suitably teachers may be trained and developed, both in-service and pre-service.

Other Innovations

1. Team Teaching
2. Flexible Scheduling-Modular Scheduling
3. Minicourse
4. Teleclass teaching techniques
5. Accountability and performance contracting
6. Installation of a differentiated teaching staff
7. Installation of learning resources centre
8. Open university teaching techniques

9. Instituting national assessment of education
10. Systems approach to education.

PERFORMANCE ASSESSMENT

This should be based on instructional objectives and the subject-matter emphasised in the instruction. Assessment should carefully 'sample' student behaviour. Preparing a table of specifications that describes the test sample and constructing objective-type test items that measure the sample of student behaviour specified in the table will help to bring about greater reliability and validity in assessment. Gronlund (1970) gives a model of the table of specifications for a 50-item test on a unit in economics, and this will be useful for test designers and item-bank depositors. As part of examination reform, continuous assessment of performance is replacing the traditional examination.

Mastery Concept

Bloom has introduced the concept of mastery. The teacher's job is to help each student achieve mastery over some operationally defined portion of subject-matter. Failure to attain mastery over some portion by a student putting forth effort is failure on the part of the teacher or breakdown of the selection system. In addition to rate tailoring or individualisation of instruction, student evaluation should be based on the concept that an achievable mastery criterion exists for each course. No longer should teachers engage in the sophistry of classical psychometrics, in which a test or examination is deliberately designed to make half the students get half the items wrong. The faculty should adopt the enlightened view of mastery-type student evaluation procedures and drastically revise their evaluation approach and grading practices. This implies that:

1. Achievement tests would have to be constructed and used as both diagnostic placement and end-of-courses determiners.
2. Courses are to be based on unit performance instead of unit time.
3. On the basis of accumulated evidence, it will be said that

student 'A' has achieved 85 per cent of course objectives instead of a 'B' grade.

4. Evalution for promotion and salary increments for teachers would be based on the measured amounts of growth exhibited by their students and on the number of students who achieved a specific mastery-criterion.

Tests Contribute to Learning

The main purpose of a test is to measure, not to teach. If it measures accurately what it is supposed to measure, it is a good test, regardless of its effect on student learning. This conception is changing. Fortunately, most tests do teach directly and indirectly. James B. Stroad, the educational psychologist, suggests that the time a student spends taking a test may be as valuable a learning experience to him as the same amount of time spent in any other educational activity. Students do emerge from a test better educated than they were when they started. Ebel (1970) explains two ways of directly increasing the contribution of tests to student learning.

One is to re-use early in the term a previous achievement test as a pre-test. This pre-test indicates to the students the kind of achievement expected of them and the basis on which it will be evaluated.

Another way of using an achievement test to contribute to learning is to give it twice—first as an in-class closed-book test and immediately thereafter as a take-home-no-holds-barred test. The students get two answer sheets, one to be turned in at the end of the test period, the other at the next class meeting. The students keep their copies of the test. During the hours between class meetings, they are free to use any means of improving the answers they gave in class, except asking the instructor. Many discuss among themselves and refer to the text, and class notes to check a questionable answer. The second answer sheet is scored in the same way as the first and the student's total score on the test is the sum of his scores on the in-class and take-home phases of it.

The original intent and the principal justification of this procedure is to augment the instructional value of the test. But it also increases the reliability of the test and probably the validity too. Tests are useful both for formative and summative evaluation (Wales, 1970).

CONCLUSION

As seen by the social economist schools and colleges are meant to convert limited taxomonies into as much learning as possible. If this is their purpose, then so must they be judged. True educational accountability means producing the most learning per rupee spent on education (Randall, 1971). We are to apply the systems approach to education, define course objectives behaviourally, measure entering behaviour of students precisely, design the teaching-learning process with an emphasis on response-oriented individualised instruction and bring about a better mix of teaching resources using technology to revolutionise instruction and evaluation to measure student learning, teaching competence and system effectiveness. A systematic feedback to all components on their operational efficiency is a 'must' to maximise learning outcome. With this, it is evident that an instructional revolution is impending. One of the concomitants of such a revolution is a drastic modification of the role of the teacher; he may be called hereafter as 'instructional agent', 'lesson designer' or 'instructional programmer'. Learning is not a way of describing student activity, but of characterising change in student behaviour and capability in the desired direction between two time markers. Teaching is exercising control on the instructional environment by arranging the scope, sequence, materials, evaluation and content for students. Instruction is the process of education and learning the product.

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BOOK REVIEWS

Student Achievement and Teachers

Teaching Behaviours and Student Achievement

Barak Rosenshine. National Foundation for Educational Research in England and Wales, London, 1971. (Pp. 229)

The study of teacher behaviours is a relatively new area in educational research. In the beginning the focus was on measuring the teacher, on getting data about the teacher's education, intelligence, experience, personality and attitude and on relating this information to measures of student gain (Ackerman, 1954; Getzels and Jackson, 1963; Gage, 1963; Morsh and Wilder, 1954). Rosenshine's book *Teaching Behaviours and Student Achievement* describes the state of knowledge of the relationship between the teacher behaviours and student achievement. The emphasis is on the perceived activities of teachers during instruction and on the relationship between these behaviours and measures of student achievement. The subject of this book is a relatively new type of educational research. It is primarily a summary of the results of approximately 51 studies in which some measures of observed teacher behaviour have been related to one or more measures of student achievement. However, the results of studies which included other potentially influential variables are also included. Such variables include allocations of time (Chapter 8), student perception of the difficulty of the course (Chapter 3), and indirect measures of teacher behaviour such as their attitudes towards teaching, subject-matter preparation, and knowledge of their subject area (Chapter 9).

Terms like 'teacher effectiveness' and 'teacher competence' are conveniently used but they usually confuse a reader or researcher just because these terms are so broad. The review in Rosenshine's book is limited to specific studies of teacher behaviour and student achievement; the relationships between teacher behaviour and other important outcomes of schooling are not reviewed in this book. Such outcomes, which are also covered under the term 'teacher effectiveness', include student attitudes towards self; school and the subject area; creativity; the disposition to use the subject area in the future; and personal development outcomes such as social sensitivity, self-confidence, responsibility and social competence (Mood, 1970). Measures which can assess all the various outcomes included in the extremely broad term 'teacher effectiveness' are not all available. This book is not about teacher effectiveness; it is about student achievement. Student achievement is inadequate as a sole measure of teacher effectiveness and the results of these studies can be seen only as tentative ideas which are worthy of further study.

The chapters in this book are according to categories based on similarities among variables which the author could see. Another investigator might have grouped them differently. The reader is cautioned to regard these categories as tentative and to expect that these groupings may be changed as new studies appear. Further, the categories presented in this book may overlap with one another to a great degree and such overlapping may differ in different countries, in different subject areas, and for different students. Thus the categories can best be seen as areas for future study and not as well-defined and well-developed knowledge.

As claimed by the author, this book gathers studies involving real teachers interacting with real students in real schools. Unfortunately, a few of the experimental studies cited in the textbooks of educational psychology, teaching methods or curriculum fit these criteria. The experimental studies cited in these textbooks usually have been laboratory studies or learning in which the instruction was mediated by written materials, films, tapes, etc. Unfortunately, educators have used these studies to make assertions about classroom instruction rather than to develop larger models in which a number of teachers would use the experimental procedures and their classroom behaviour would be observed. There have been a few experimental studies in which: (i) teachers were trained to teach in a specific manner, (ii) measures of instructional behaviour were obtained, and (iii) the student achievement in experimental classrooms was compared with student achievement in the control classrooms. These studies are reported in this book.

This book reveals that a large number of variables, typically included in lists of 'Dos' and 'Don'ts' for teachers, have not been studied in a natural classroom situation. The function of homework appears to be one of these unstudied variables. Teacher motivational techniques appear to be another major unstudied variable. Much has been written about motivation and numerous experimental studies have been conducted in laboratory settings. But teachers' motivational techniques do not appear to have been studied directly in these studies assembled for this book. Other variables of interest which apparently have not been studied or have appeared only in one or two studies include the learner's ego involvement, the types of tests which the teacher uses, and the type of feedback which the teacher provides on these tests, teacher's perception of the subject-matter, etc.

Perhaps the best use of this book will be as a source of ideas for future studies. One type of study which might evolve from this book is a correlational study in which the investigator attempts to replicate the importance of some of the variables which have been significant correlates of student achievement in previous studies. Another type of study is an experimental study in which teachers, who are low on a variable such as clarity of presentation are trained to improve their clarity, and the effects of the training are tested by obtaining new measures of trainees' clarity and new measures on the achievement of their students.

The book presents an excellent review of available studies in which teacher behaviour was studied in relation to student achievement. This volume is likely to encourage future research in this area and to provide illustrations of how the research might be conducted. It carries good lists of reference and test materials.

L.C. SINGH

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Research in Educational Planning

Research for Educational Planning: Notes on Emergent Needs

William J. Platt. International Institute for Educational Planning, Unesco, Paris, 1970. (Pp. 67, price $ 2 or £ 0.6)

This report on *Research for Educational Planning* discusses problems and difficulties recently brought to light in connection with the evaluation of educational systems and describes under each of the main six areas, subjects which appear to call for special investigation by the researchers in all the fields of specialisation in education. The report is based on information supplied by more than forty institutions and individuals and discussions held in the five-day workshop in Paris in July 1969 by the Directors of the four Unesco Regional Training Centres and by the representatives of universities and other training and research bodies with a special interest in the problems of educational planning. This workshop was organised by Philip H. Coombs and he was assisted by an eminent educationist, William J. Platt. Coombs also prepared a background document for the workshop, giving the scope of discussion, problems in and approaches to educational research, possibilities for international cooperation in research, the present state of knowledge, etc., which appears as Appendix D in the report. In particular, he emphasises the need to investigate four important areas to overcome the problems of the world educational crisis: (a) the modernisation of educational management; (2) the modernisation of teachers; (3) the modernisation of content and the learning process; and (4) increased emphasis on non-formal education.

At the end of his paper Coombs observes:

> The simplest kind of planning is to provide for the steady enlargement of an existing educational order in its old image, but this is precisely the kind of planning that could do more harm than good, by entrenching the old order even more firmly. What we clearly need is *educational planning for change.* It will take the help and ingenuity of the world's best social science researchers to achieve such planning and to make it effective. (p. 67).

Incidentally, in 1965, the International Institute for Educational Planning (IIEP) published *Educational Planning: An Inventory of Major Research Needs* which had proved very useful to producers and users of research in educational planning. Appendix C (pp. 57-58) mentions that out of 25 projects suggested in the *Inventory*, the following six projects attracted a considerable amount of research effort during 1965-69:

(1) Development and dissemination of improved methodologies of educational cost analysis.
(2) Educational unit costs in developing countries.
(3) Applying educational innovations in developing countries.
(4) Methods of manpower projections: a critical evaluation.
(5) Country case studies.
(6) Organisation and administration of educational planning.

No doubt, the inventory proved to be very useful during recent years but there has been a rapid change in objectives and organisation of educational systems all over the world and it has given rise to precise research needs, which were not even imagined in 1965. Therefore, the present publication under review is a most welcome outline of research in educational planning, at least for the next four or more years.

The material in the report is organised into four chapters and four appendices. The first chapter gives 'criteria for selecting research needs'. Chapter 2 lists 15 major research projects under six sections and Chapter 3 gives the comparative position of research needs in 1970 and 1965. Chapter 4 deals with international cooperation in educational research and planning.

Chapter 1 sets out the premises, definitions and criteria on the basis of which participants in the workshop selected research needs. The first of the three premises adopted in the workshop was that the planners are of great help to decision-makers and policy-makers when they identify *emergent problems* and when they project their possible present and future consequences of decision and policy choices. The second premise was that the strategy of linear expansion of educational systems during the last decade is no longer adequate and more stress should now be laid on 'qualitative changes in structure, content and methods and in the relationships of education to the needs of society'. It is mentioned here that 'qualitative reform commanded the workshop's main attention, even though difficult expansion problems remain to be solved' (p. 9). Therefore, the main concern of the workshop was that the research in education should directly be useful to educational planners and policy-makers. Thus the workshop was not only concerned with traditional criteria like *validity*, *reliability* and *replicability* of research but also with *relevance* to planning and policy-making. Further, the workshop defined research in educational planning to include what is normally included in 'research and development'. Thus, the research in education is not only light-giving but also fruit-bearing. However, the participants did recognise the fact that every problem facing planners and policy-makers in education is not researchable. In the light of these criteria the workshop considered 15 areas of research listed in Chapter 2 as timely and important to the advancement of educational planning and development in the developing countries. The main 15 areas of research are grouped under six broad categories in Chapter 2 which are briefly described below.

A. *Performance of Educational Systems*

Educational institutions can perform better as systems or sub-systems if research results can help to clarify the educational objectives and priorities and if benefit-cost analysis can be broadened to comprehend more of what society and individuals expect from education. The suggested problems here are:

1. Clarification of educational objectives.
2. Measurement of indirect and non-monetary benefits of education.

B. *Mutual Adaptation of Educational and Economic Systems*

Planning can more effectively allow for the reciprocal influences of economic development on education and education on economic development, if the research can throw light on the feasible linkages between the school system and the changing world of work, including rural transformation. The projects suggested here are:

3. Harmonisation of the manpower planning with the educa-

tional planning.
4. Improvement in occupational educational linkages.
5. Educated unemployment.
6. Education for rural transformation.

C. *Internal Effectiveness of Education Systems*

Internal efficiency of educational institutions can be improved by investigating the following areas of education:

7. Wastage in education.
8. Improvement in educational evaluation.
9. Provision of individualised instruction.
10. Introduction and continuation of innovations in education.

D. *Resources Employed in Education*

Educational advancement depends on finding out new ways for financing of education and on improving the capabilities and effectiveness of teachers as the key human resources in education. The suggested projects here are,

11. Mobilisation of additional resources for education.
12. Qualitative improvements in teaching manpower.

E. *Life-long Learning*

Training and educational instructions outside the formal school system appear to offer opportunities to help meet key human development needs. The suggested project here is:

13. Survey of organised out-of-school education.

F. *Administration, Planning and Management of Education*

Research is needed to find out methods and means to improve the functioning of educational administration and planning and to apply theories of management to the education industry. The projects suggested here are:

14. Public participation in educational administration.
15. Advancement in theory and practice of educational planning and management.

However, the list of projects as suggested here is not quite exhaustive but indicates a broad pattern of research in the field. Chapter 3 compares the current status of research in educational planning with that in 1965, and in Chapter 4 twelve proposals have been advanced for international cooperation in research.

The Unesco authorities and Mr. Platt are to be complimented on this report.

H.N. PANDIT

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Letter to the Editor

BICYCLES ALSO VARY !

Sir,

I read with great interest Prof. T.R. Sharma's paper "Measuring Intelligence through Bicycle Drawings" in the January 1972 issue of your journal. While I have all praise for Prof. Sharma's attempt to construct a culture-free test, it seems to me that some of his premises and inferences are open to question. Prof. Sharma feels that the "Draw-a-Man", "Draw-a-House", and "Draw-a-Cow" tests suffer in universality because of variation in concepts of sex and dress among children from different environments and lack of equal familiarity with these objects by children. Unfortunately the same logic applies to the "Draw-a-Bicycle" test. Like dress, houses and cows, bicycles too come in different models and shapes. Boys' bicycles, girls' bicycles, racing bicycles, bicycles for small children—all come in different models and shapes. Again, bicycles in one country differ somewhat in shape from bicycles in other countries. For example, in American bicyles the handlebars are placed much higher than in other models. Bicycles for small children have built-in castors on both sides of the rear wheel so that the bicycle does not fall down. Thus one of the main advantages of the bicycle for Prof. Sharma, that is, "It lacks variety" (page 4, last line) is lost.

Again, there are parts of the world where the bicycle is very rarely used, e.g., deserts, rough hilly tracks and snowbound regions. Such regions have their own modes of transport. Moreover, a large number of families do not have a bicycle. This is especially true of a poor country like India where even the bicycle is a luxury. Children who come from households possessing a bicycle are likely to do much better at drawing a bicycle than children whose families do not own one. Thus, the familiarity and non-familiarity effects cannot be ruled out.

Further, on page 4, Prof. Sharma says: "Its drawing is seldom practised in schools or the homes" (fifth line from the bottom). Later, on page 18, he states: "Bicycle is a favourite drawing subject for children who strive to represent it as it appears to them (statement No. 1 in the second para). The two statements are obviously contradictory.

Again, on page 5, Prof. Sharma has assumed that "...a child starts making use of the bicycle at the age of 10-11,..." (fourth line from the top). This assumption seems questionable. In families which own a bicycle, it is generally seen that the children start using the bicycle at an earlier age, say from 8 or 9 years onward.

However, the pains that Prof. Sharma has undertaken in preparing the details of the Scoring Scale deserve all praise. The various reliabilities are very near each other, with the sole exception of the test-retest reliability. In this case we do not know whether the difference was due to some weakness in the method or in the test itself. For example, it could be due to any of the factors like parent's income, possession of a bicycle by the family or otherwise, the locality in which the child lives, etc. One feels that these factors should have been taken into account while estimating the reliability and validity of the test. Lastly, the test has not been validated through a cross-cultural study. Thus the claim that the test is "to a great extent culture-free" (p. 18, para 2, statement No. 2) is without empirical evidence.

All the above notwithstanding, I would like to pay a tribute to Prof. Sharma for his original idea in test-construction, for the greatest need in educational research today is the need to go off the beaten track and strike out along new directions. Prof. Sharma should be thanked by all researchers in education for having done so.

Yours etc.,
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